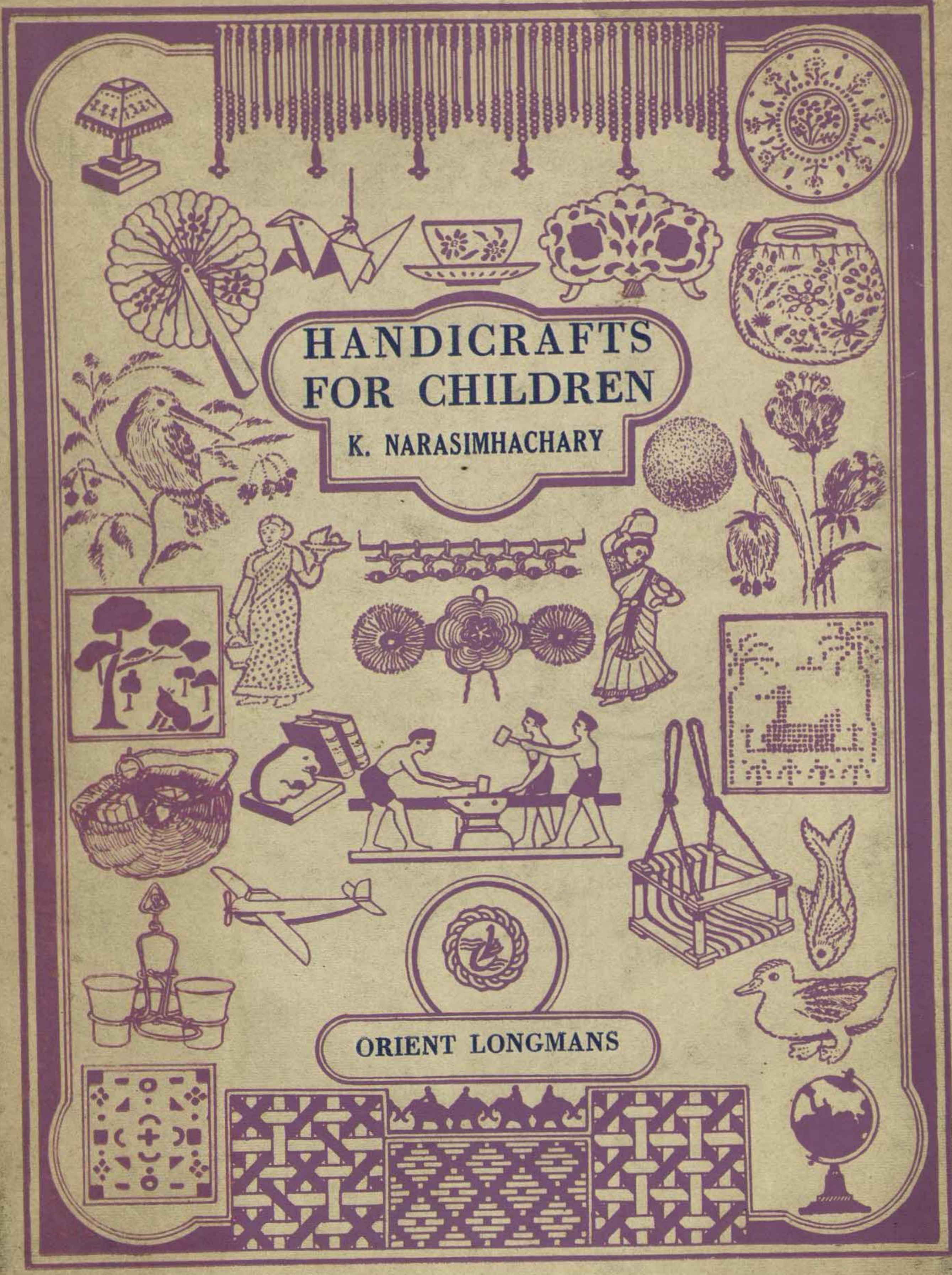

HANDICRAFTS FOR CHILDREN

K. NARASIMHACHARY

ORIENT LONGMANS

Opinions on the
Telugu Edition of this book
already published

This book, Handicrafts for Children, won the India Government's award for children's publications in 1961. It has been prepared by a former lecturer of the Teacher's College, Saidapet, and the illustrative lessons will not only be a practical guide to students but will also be useful as a ready reckoner for teachers. The main purpose of the book is to divert into constructive channels the spare time activity of children. Special care has been taken to make the children easily grasp the directions given in the field of making toys embroidery and other works.

—*The Hindu*

The book gives directions for children to plan and collect the materials necessary, for handwork of all sorts, and also guidance with detailed notes and diagrams. The language is lucid and easily followed. It also contains instructions for making dolls with movements. This handicraft closely follows the Japanese pattern. A reliable guide for those who have a bent for handicrafts.

—*The Mail*

Rs. 9.50

Handicrafts for Children

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The Telugu edition of this book was awarded a prize in the VII Children's Literature Competition 1961 by the Government of India.

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INTRODUCTION

IN the midst of the multifarious activities of children there is nothing like a good hobby to attract their minds and keep them engaged in healthy pursuits. In school or at home, it is our duty to see that they grow up healthy both physically and mentally. We should try to relieve them of the monotony of study by affording them opportunity for some work of absorbing interest. Handicrafts provide the necessary material and incentive for such healthy diversion. Handicrafts will help to create in children an interest and zeal for work and keep them attached to useful self-employment.

This book on HANDICRAFTS FOR CHILDREN deals with creative, recreational and utilitarian activities for children of the age group 7 to 14 years. In this work, I have endeavoured to place before children, both boys and girls, material for learning simple crafts and to create in them an abiding interest in this kind of work and a desire for acquiring greater and greater skill and knowledge that may encourage them to embark on more serious activities in the industrial and engineering fields when they are grown-up. It has been recognised that Handicrafts have a therapeutic value also, and as such their importance cannot be exaggerated.

This book is the English version of the Telugu book on handicrafts entitled *Biddala Cheti Panulu* which was awarded a prize by the Government of India in the Competition for Children's Literature held in the year 1961. It contains one hundred and fifteen plates with over a thousand drawings accompanied by explanatory matter for each lesson, written in easy style. The subjects dealt with cover a variety of handicrafts for children. The drawings are such as to enable them to do the jobs themselves with self-reliance and confidence, even in the absence of outside help.

There are lessons on PAPER-FOLDING AND CUTTING, CARD-BOARD MODELLING, FRET-WORK WOOLLEN FLOWERS AND BALLS, MECHANICAL TOYS, PAPIER-MACHE WORK, PICTURE FRAMING, STENCILLING, STICK AND POTATO PRINTING, STRING BAGS AND HAMMOCKS, WIRE MODELS, BEAD CURTAINS, EMBROIDERY, SOFT TOYS ETC. I have put into this book my experience of over forty-five years as a teacher of Drawing and Arts & Crafts to Children as well as Teacher Trainees in Elementary and Secondary Schools and Training Colleges. The references to drawings are all in numbers so that children can study the drawings easily and learn to do things as explained. In every plate, the numbers in large size indicate the main items and the numbers in smaller size the parts of the main items.

In practical work like handicrafts, it is good to read the explanations carefully while following the drawings; it will then be easy to make the things. Sometimes the result may not be successful at the first attempt and repeated attempts may be required, especially when making mechanical toys, soft toys, wire models and complicated card-board models. But careful planning, patience, perseverance, accuracy, and tidiness will give good results.

There are some simple tools and materials which have to be collected and preserved. A collection of cut off remnants of various colours and patterns from tailors' shops, of reels, spools, wire nails, screws, empty tins, cardboard boxes, tools like cutting pliers, pen-knife, a pair of scissors, foot-rule, sand-paper, water colours, tempera or oil colours, brushes, cotton threads of different colours, needles, gum, paste or glue, etc., would be necessary.

Care must be taken to see that in using sharp tools children do not cause any injury to themselves or damage to the articles they make. An album of nice pictures of birds, animals and scenes will be of great help for tracing, copying or reference.

The aim of every child should be to make beautiful articles with good finish. Handicrafts will then prove an attractive and even profitable employment for the leisure hours and will at the same time improve the children's intellectual growth and inventive powers.

It is my hope that this book will satisfy, at least partially, the needs of the young folk in the matter of craft education, and it will be a matter of great gratification for me, if I succeed in realising it in some measure.

K. NARASIMHACHARY.

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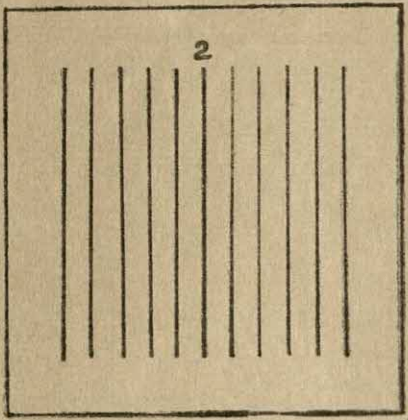
PART I

Plate 1

PAPER WORK



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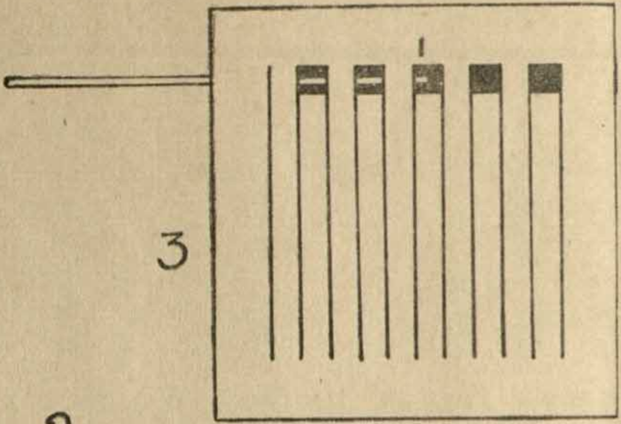

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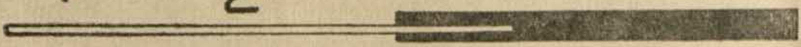

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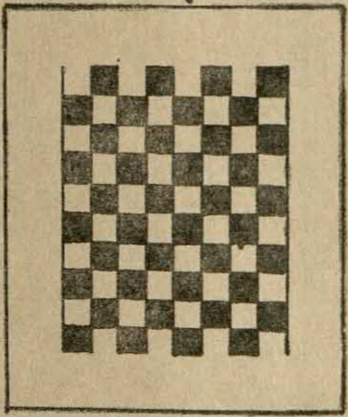

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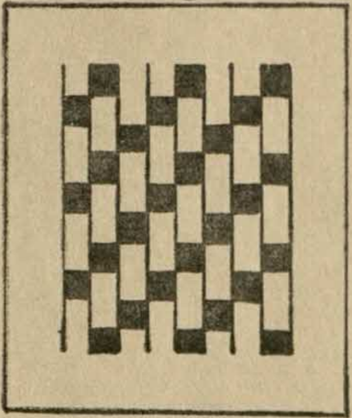

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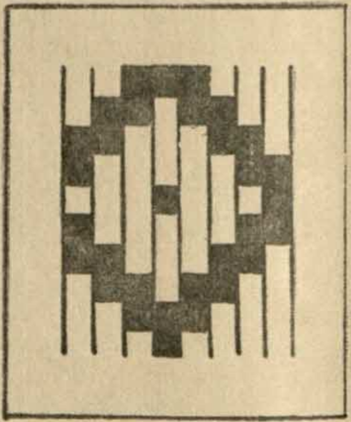

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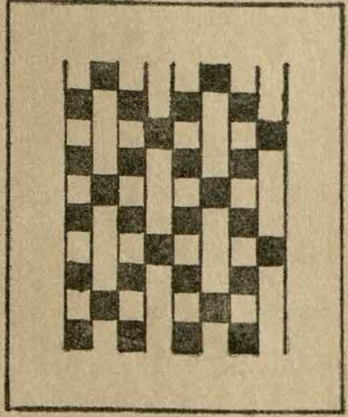

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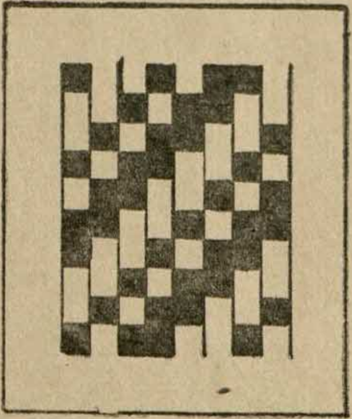

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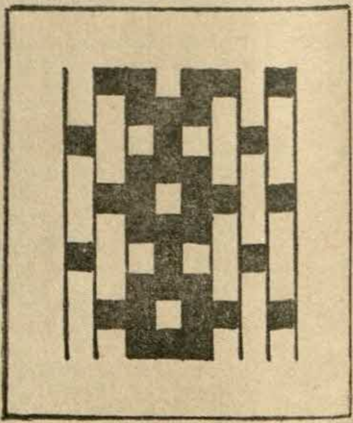

MAT PLAITING

This is done by plaiting strips of colour paper into paper warp which may be of a different colour. Take a piece of paper, leave a broad margin all round and cut strips of equal width as shown at 2, FIG. **1**, **Plate 1**. For woofs, cut plenty of colour strips of equal width as 2, in FIG. **1**. Take a broom stick, split it at one end, and insert the colour strip as in FIG. **2**. Pass the broom stick with the colour strip under and over the warps, as 1, FIG. **3**. When the whole strip is woven, take out the stick and weave other strips as in FIG. **4**. Always let the ends of woofs remain under the margins. When the mat is complete, stick the ends under the margins. You can make any number of patterns as shown in FIGS. **4** to **13** in **Plates 1** to **3**. In these examples the woofs are taken across the warps at right angles. There is another kind of weaving in which the woofs are woven diagonally, as shown in **Plate 4**. Cut the paper as FIG. **1**, **Plate 1,** and remove the alternate strips 2, 2 etc., as FIG. **1**, **Plate 4**. Weave these strips across the uncut strips of the paper leaving alternate shaded spaces blank as FIG. **2**. Cut off the projecting ends 1, 1. Take colour strips and weave them diagonally as FIG. **3**. In this pattern the woven strips are not of the same length. Different patterns are shown in FIGS. **3** to **9** in **Plates 4** and **5**. You can plan and design many more such patterns.

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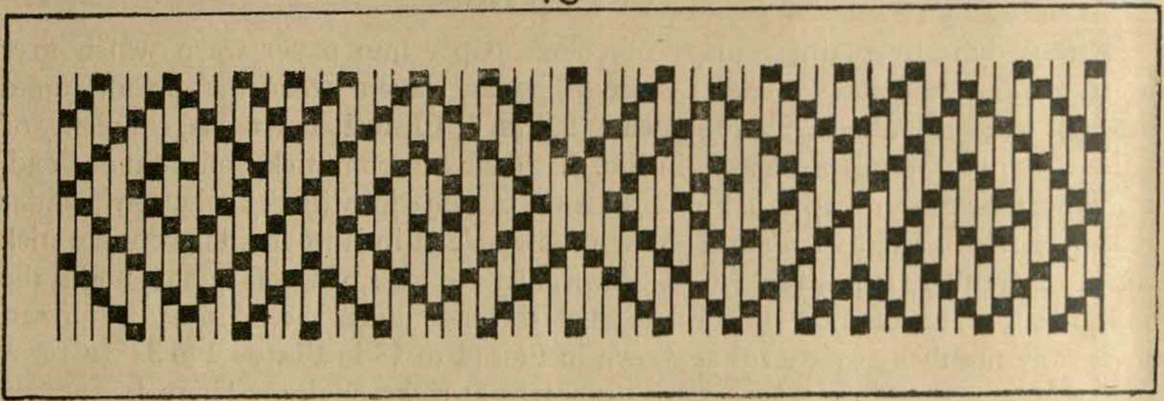

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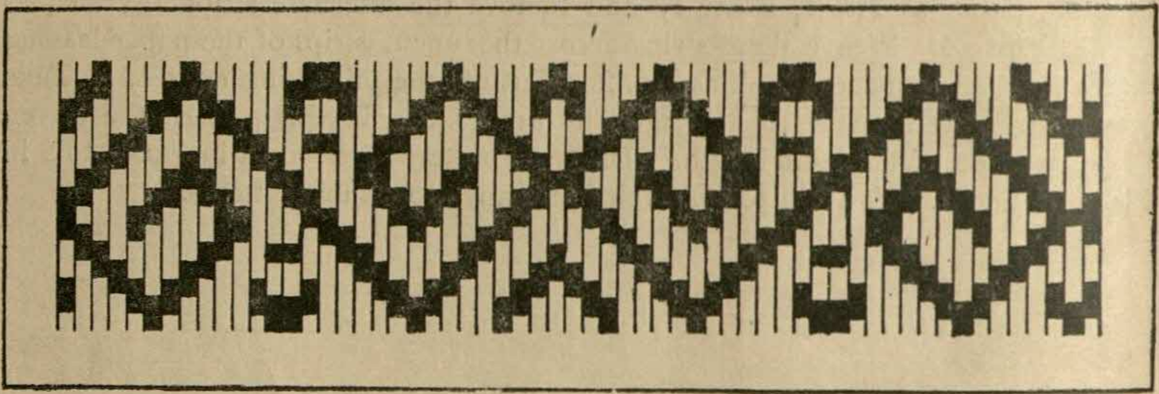

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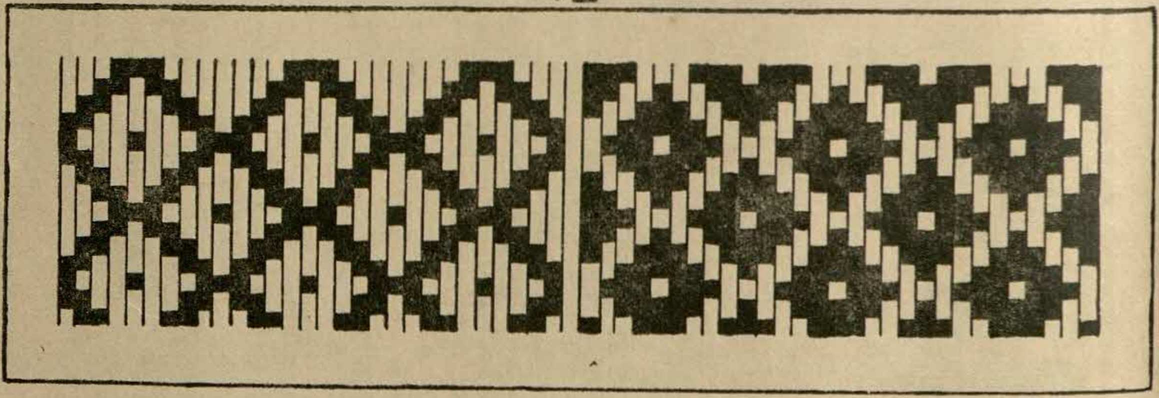

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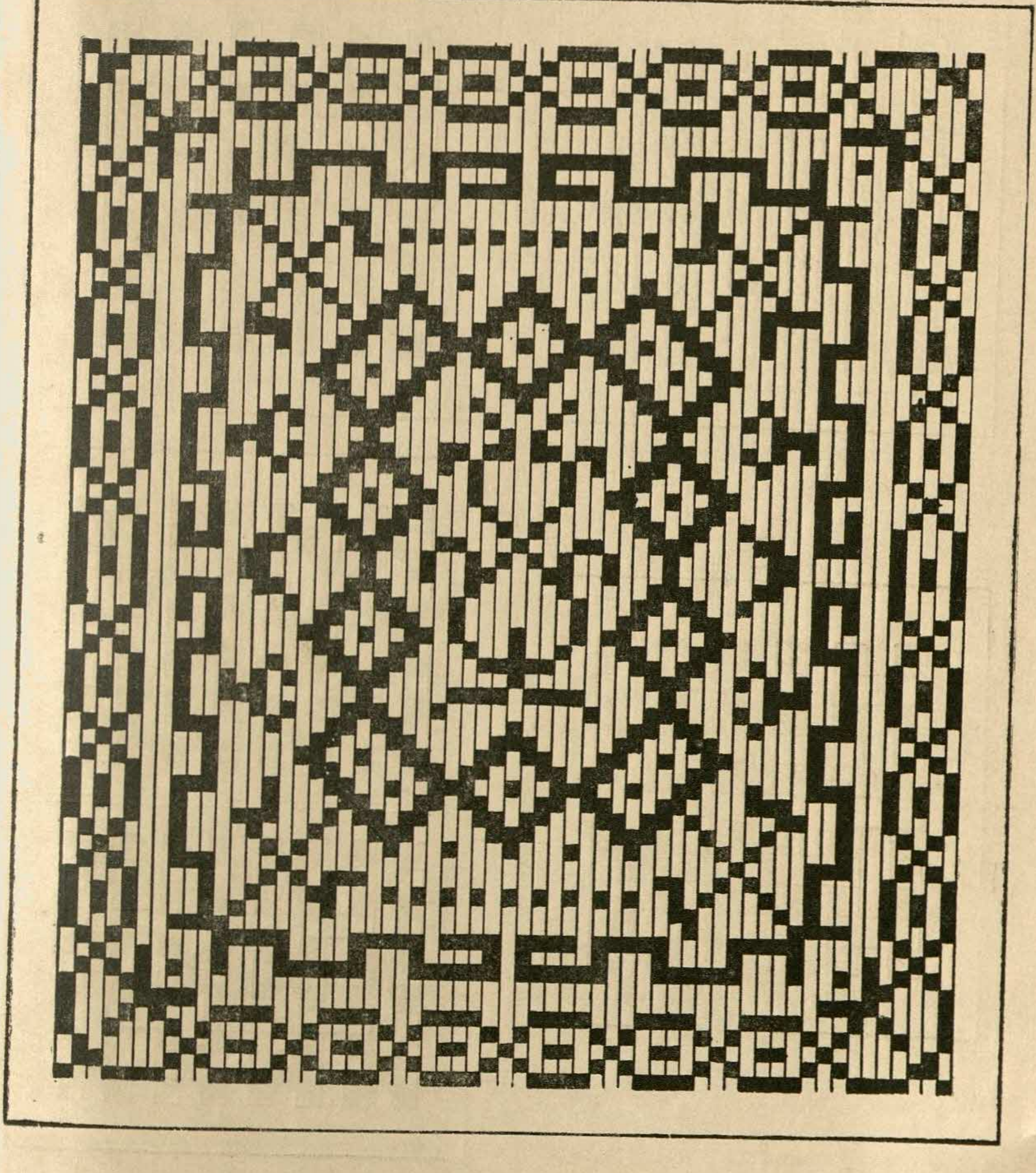

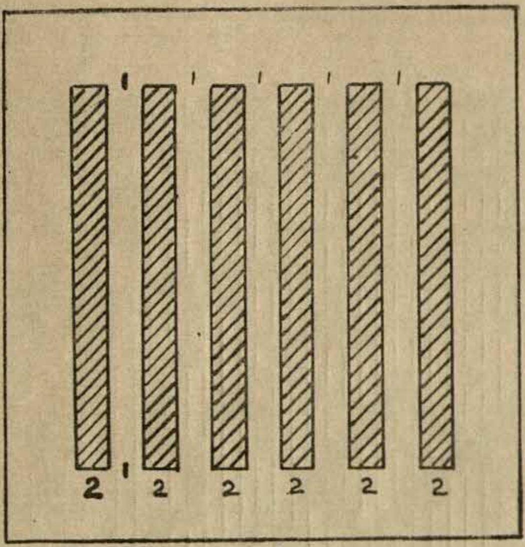

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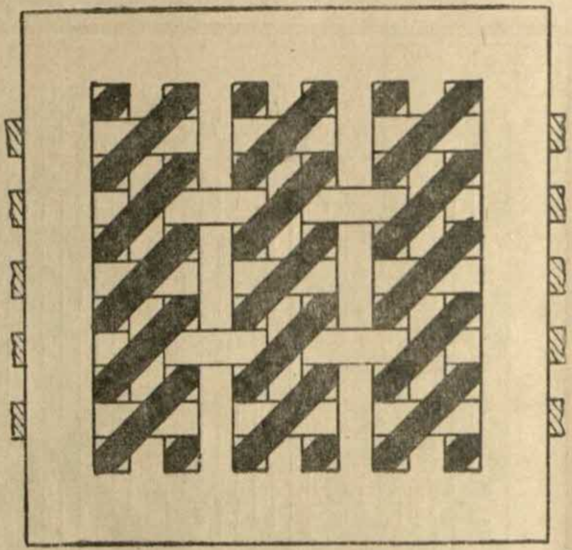

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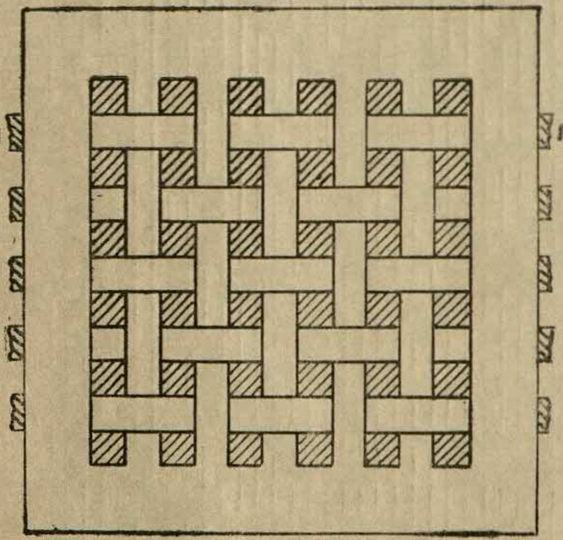

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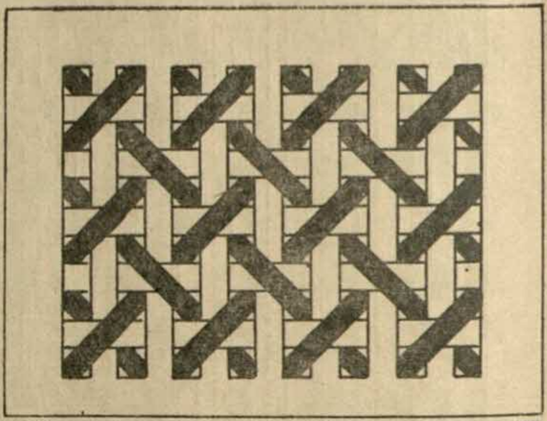

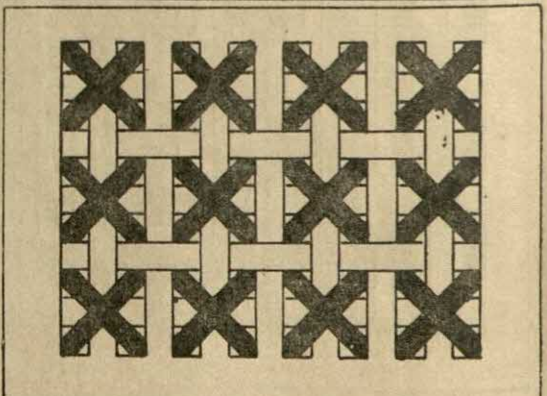

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Plate 5

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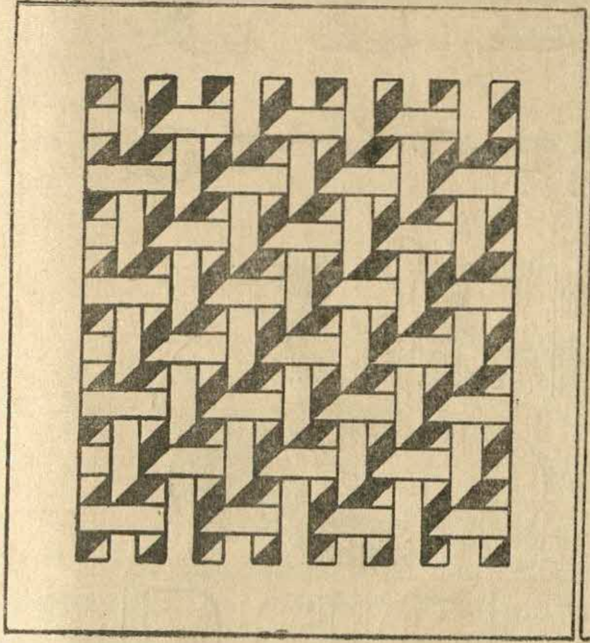

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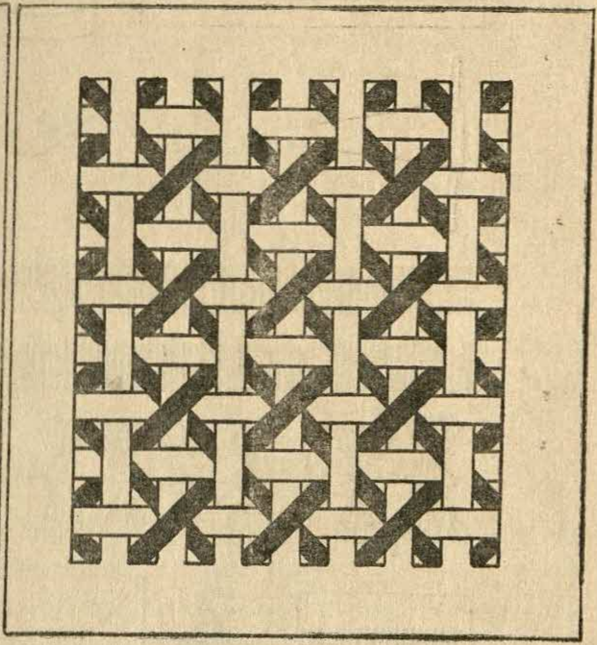

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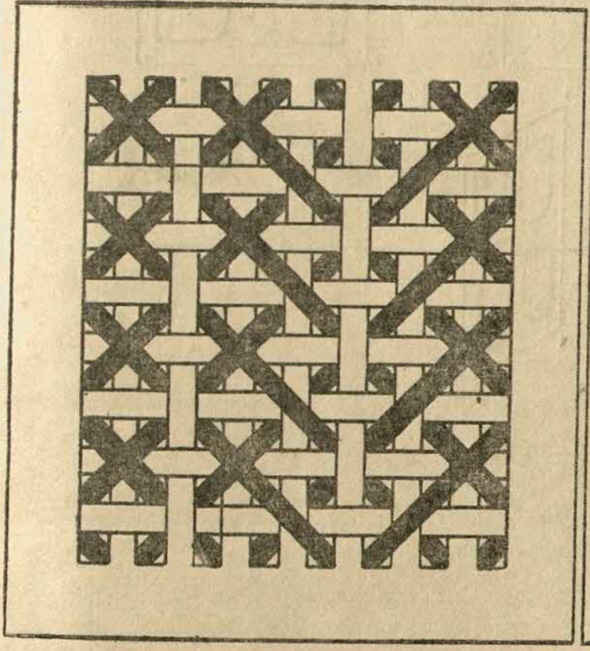

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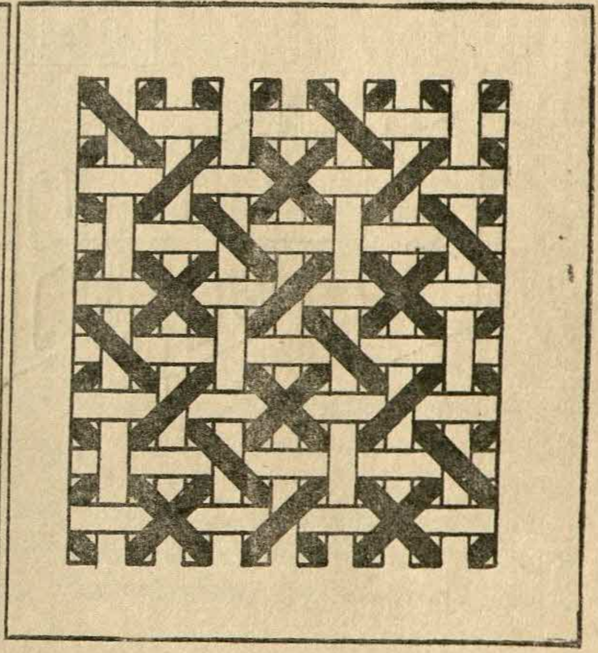
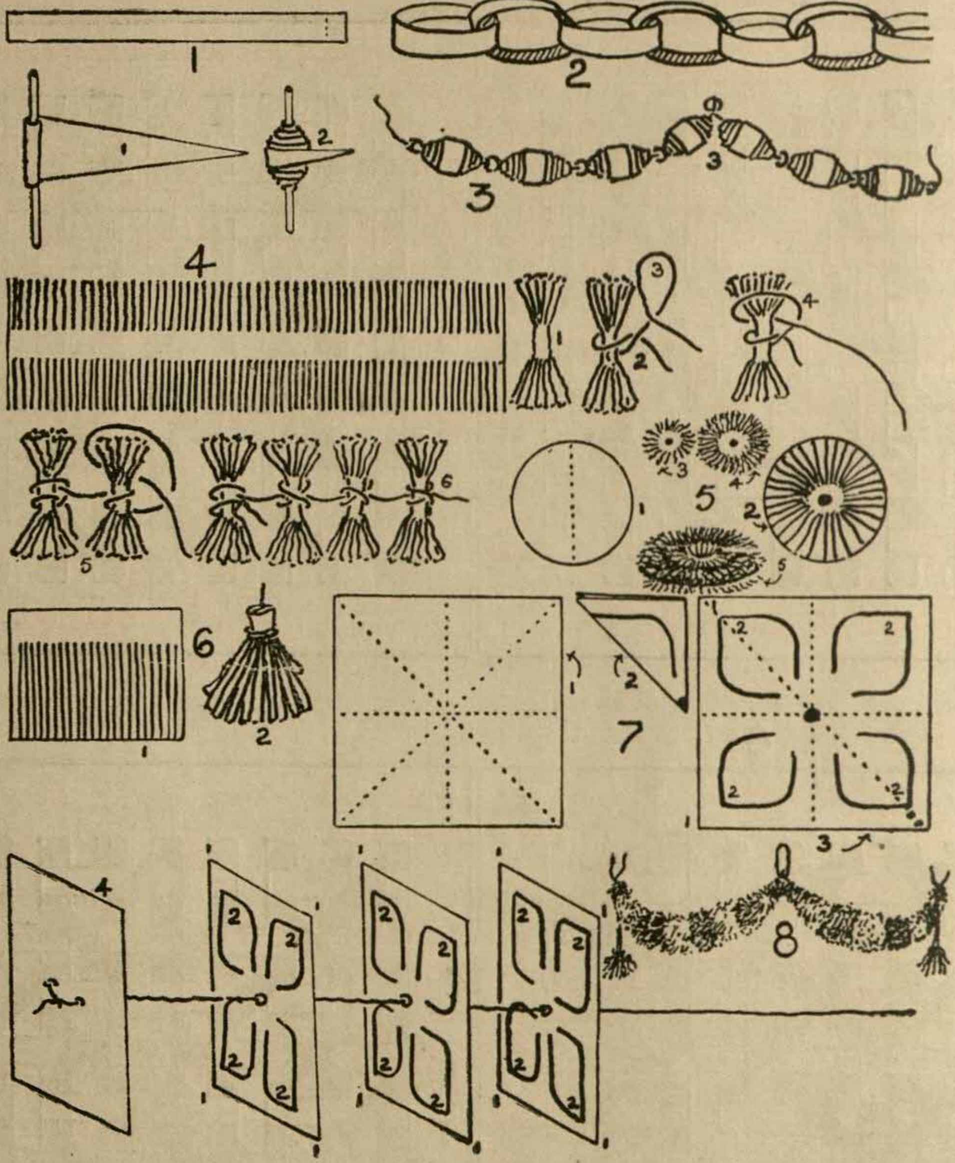




Paper folding and cutting is a very interesting and useful hobby for boys and girls, as well as for grown-ups. It is also educative as it sets you thinking as to which kind of cut produces which kind of design and also gives you good practice in geometrical patterns. It can be used for decorative purposes during festivals like Navarathri, Christmas, etc. You can make garlands, festoons, lanterns and fans in paper. You may have heard that the Chinese and Japanese are experts in arts of this kind. It can afford a living to the really proficient.

GARLAND I

Take strips of paper of different colours, about four inches long, FIG. **1**. Stick one strip into a ring. Take another and pass it through the first ring and stick it. Take different colours in any order and make a chain, as FIG. **2**.

BEADS

Take a narrow triangular bit of paper and roll it lightly round a bit of stick, as 1, FIG. **3**. After rolling it round the stick two or three times, apply some paste to the remaining part of the paper and roll it to the end, as 2, FIG. **3**. Take it out from the stick. You have now a bead with a hole. Make a number of beads, paint them over first with shellac and after they are dry, paint them again in any colour you want. Make them into a garland, as 3, FIG. **3**.

GARLAND II

Take a long strip of tissue paper of any colour, about an inch broad, and of any length. Fold it to a length of about two inches and cut the edges on both sides and open out, as FIG. **4**. Cut a small bit out of this and roll it as 1 FIG. **4** and stick the end to keep it from unrolling. Prepare a large number of these bits in different colours like orange, red, white and yellow. Take one of them, tie it with a piece of thread, as 2, FIG. **4**. Follow the course of the thread and proceed. First take the thread round the paper, as 2, make a loop of thread, as 3, and slip the loop over the paper, as 4, FIG. **4**. Add another rolled paper to this in the same manner as 5 and continue as 6 till you get the required length to complete the garland.

FLOWERS

Cut circular bits of tissue paper in different colours and sizes as 1, 2, 3, 4, FIG. **5**. Cut 1 as 2. Cut also smaller bits likewise. Stick a few large bits at the bottom and go on adding smaller bits until you get sufficient bulk of the flower, as 5, FIG. **5**. This is the chrysanthemum flower.

BUNCH

Cut a piece of paper along one edge, as 1, Fig. **6**, and roll it as 2, and you get the bunch which can be attached to a paper garland. A piece cut like this and not rolled may be stuck round a lamp shade or used as a fringe to any border.

FESTOON

Cut a large number of squares of tissue paper of $2\frac{1}{2}'' \times 2\frac{1}{2}''$ size, as 1, Fig. **7** and fold each into halves both ways and along the dotted lines, as 2, Fig. **7**. Cut along the dark line and the corner which is the centre and open out as 3. The figure shows the four corners 1, 1, 1, 1, cut away from the petals 2, 2, 2, 2. Take a piece of card of the same size and tie a bit of twine to the centre of the card, as 4, Fig. **7**. Slip all the cut squares on the twine as shown. Stick corners 1, 1, 1, 1 of the first square to the card, and stick the corners 2, 2, 2, 2 of the petals to the same corners of the second square. Stick 1, 1, 1, 1 of the second square to 1, 1, 1, 1 of the third square and continue this till you have a large bundle of squares stuck together. Put a card at the other end as at the beginning. The whole festoon is supported by the twine. If the bundle is stretched out on the twine you can have a festoon of great length. When the festoon is not required to be hung up, you can fold the whole bundle into a compact size between the cards and preserve it for future occasions.

GARLAND III

Cut bits of paper in different sizes and colours, as 2, 3, 4, Fig. **5**. Put them on a string, as Fig. **8**. First mark the centre of the string and on either side of it take one of the cut pieces beginning with the smallest size. Increase the bulk towards the middle of each side by taking bigger pieces and reach the ends of the twine with the smallest pieces as shown in the figure. Attach a bunch made, as 2, Fig. **6**, to the ends of the garland.

HANGING SPIRALS Plate 7

Take a bit of paper and cut out a circle. Draw a spiral on it as Fig. 1 and cut along it. Hold the centre by thread and the rest hangs down by its weight as Fig. 2.

HANGER

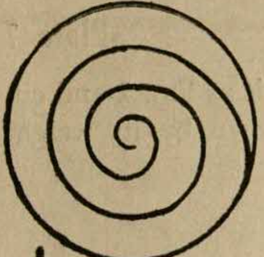
Take a square piece of paper and fold, as 3, 4, 5, and then along the diagonal, as Fig. 6. Cut slits alternately from the right and left sides as shown. The same may be done with a circle as Figs. 8 and 9. Open out the paper and put some weight in the centre, Fig. 7. The spirals, squares, and circles thus cut may be hung up along a line. This will serve as a nice piece of decoration.

SCREEN

Take a rectangular piece of paper and fold it into half and quarter in a backward and forward direction as Fig. 10. Cut it alternately from both edges as shown by dotted lines in Fig. 11. Open out and pull along the sides and you will have an expanded screen as Fig. 12.

LAMP SHADES Plate 8

Take a long rectangular piece of paper and fold it in the middle along 2, 2, Fig. 1. Cut slits as Fig. 2, leaving a narrow margin along the edges. Fold along the margins outward as Fig. 3 and bring the ends together and stick into the form shown in Fig. 4. It may also be formed as in Fig. 5 by attaching two such units together. More units may be attached, one below the other. If you fold the margins inwards and bring them together to overlap one another it will look like Fig. 6. Fig. 8 is another form that may be made. Take a piece of paper and cut it from one edge, leaving a margin of about half an inch at the other edge, as Fig. 7. Take the loose ends of the strips round to the margin, alternately to the right and left, and stick them as Fig. 8.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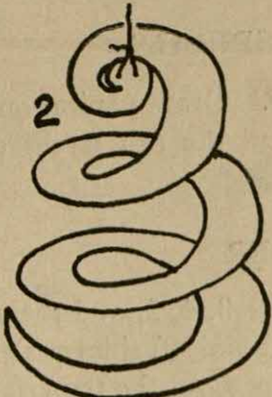
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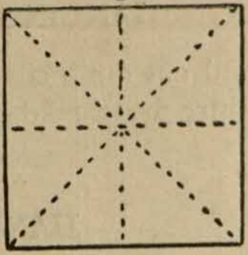
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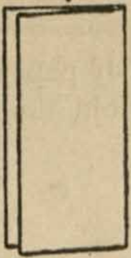
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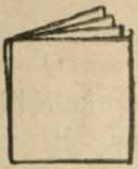
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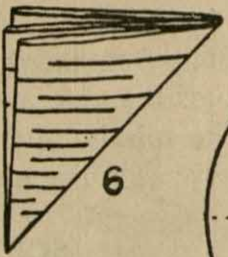
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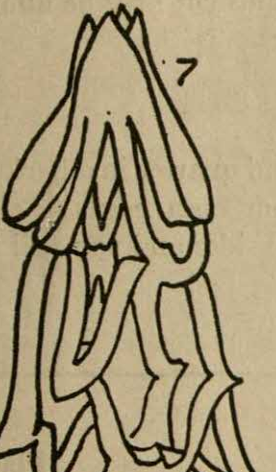
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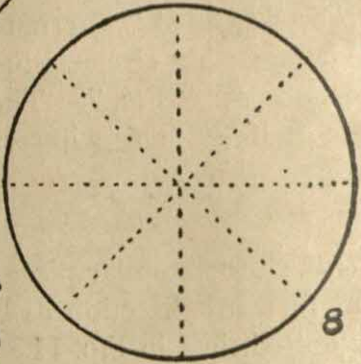
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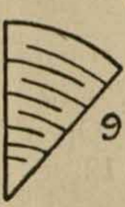
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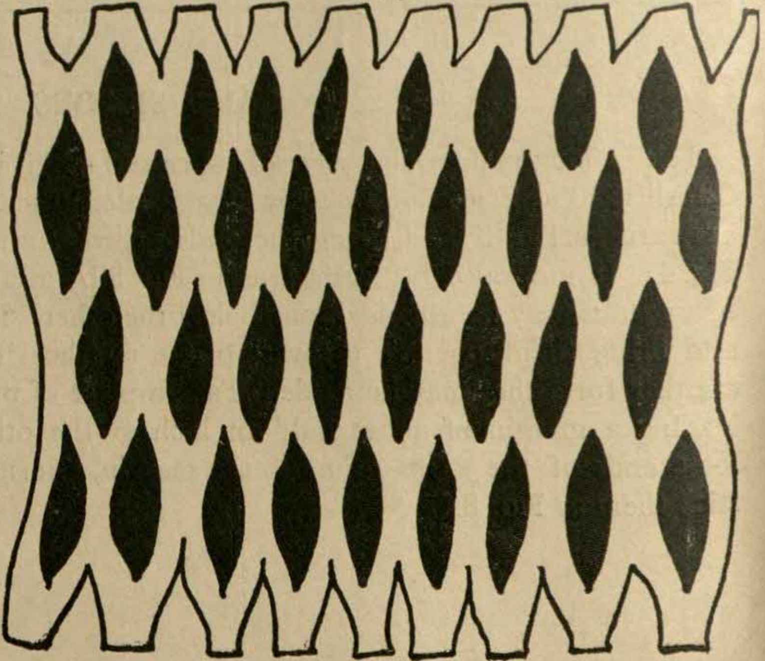
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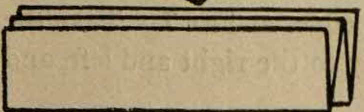
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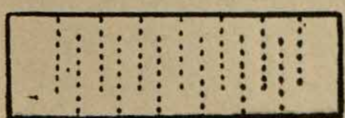
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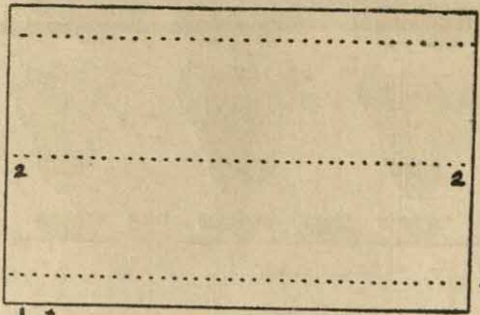
PAPER WORK

Plate 8



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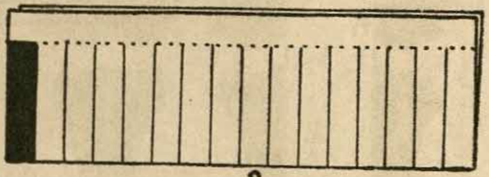

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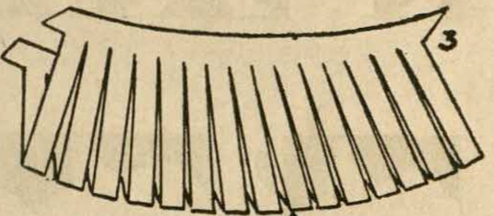

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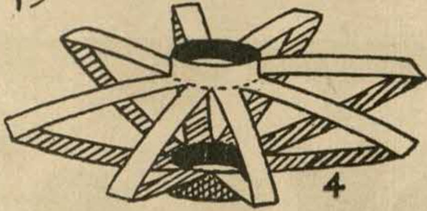

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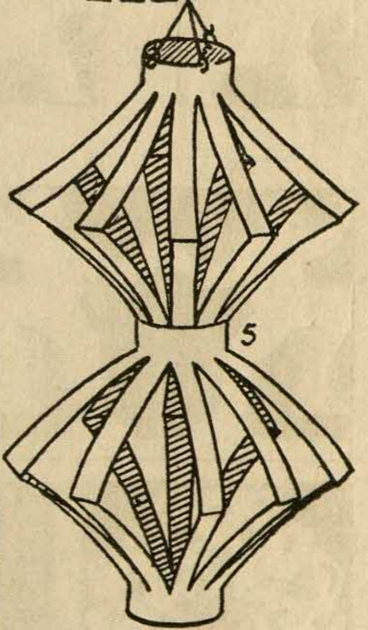

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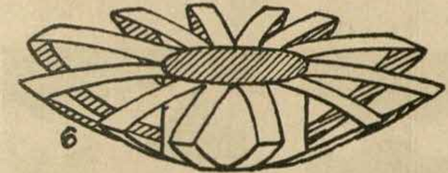

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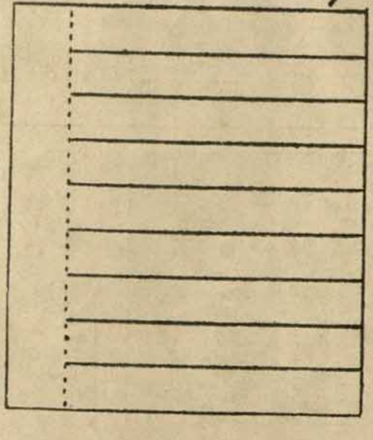

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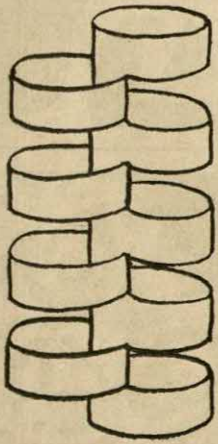

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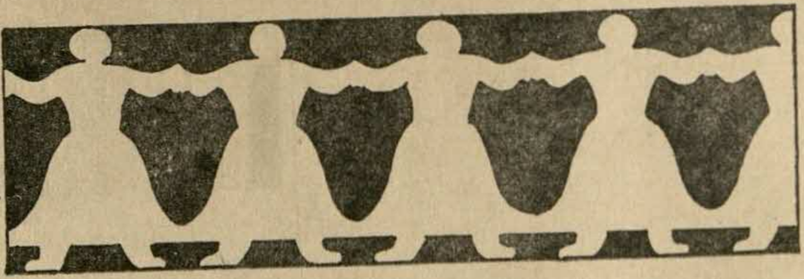
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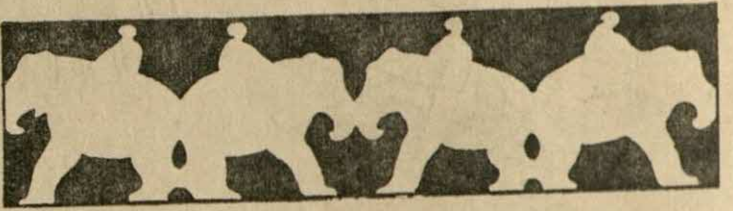
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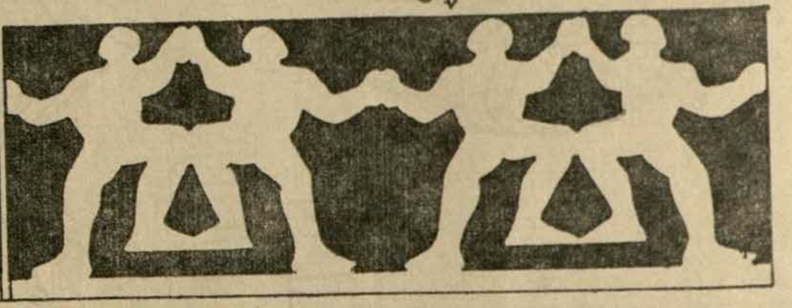
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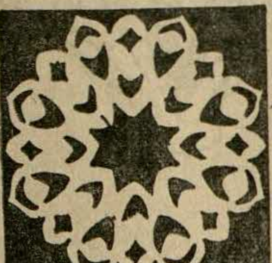
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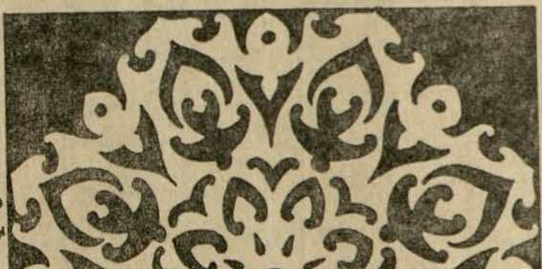
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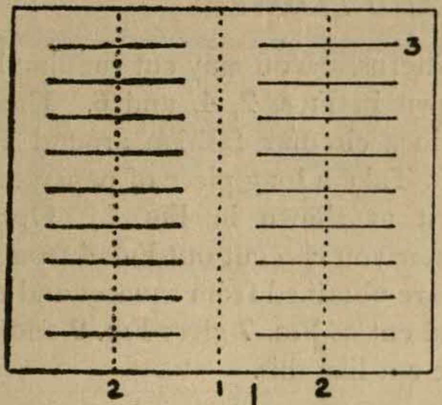
CUT-OUT BORDERS AND FLOWERS

You can cut paper into any number of patterns. You may cut running border designs as shown in **Plate 25**, or as shown in FIGS. **2**, **4**, and **6**. These can be used as borders along a straight line or in a circular fashion around a lamp shade or in any suitable manner you like. Take a long piece of paper and fold it a number of times fan-wise. Cut it as shown in FIG. **1**. Open out and you will have FIG. **2**. In the same manner you can cut out FIG. **4** from FIG. **3** and FIG. **6** from FIG. **5**. The flower patterns are obtained from squares and circles, folded and cut. Paper folded into eight and cut as FIG. **7** gives FIG. **9** and FIG. **8** gives FIG. **10**. Innumerable patterns may be cut like this.



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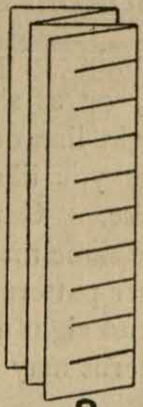

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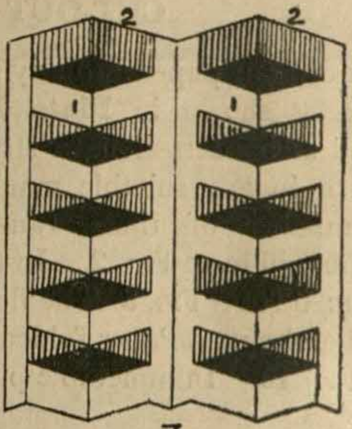

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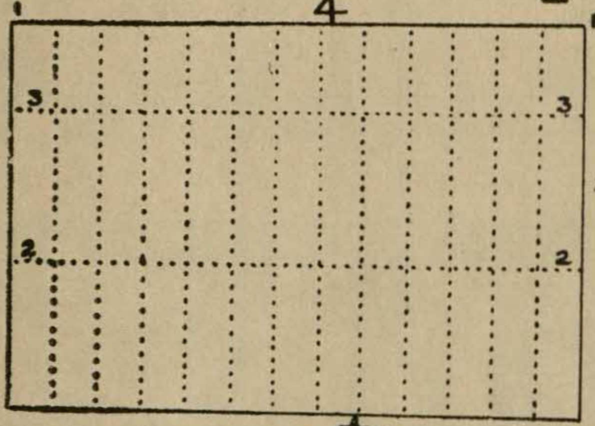

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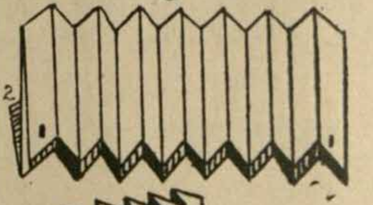

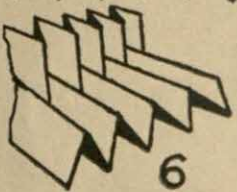

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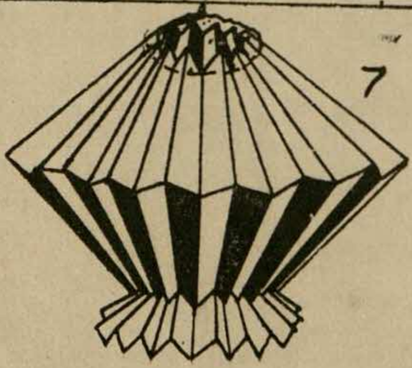

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PAPER WORK

Plate 10

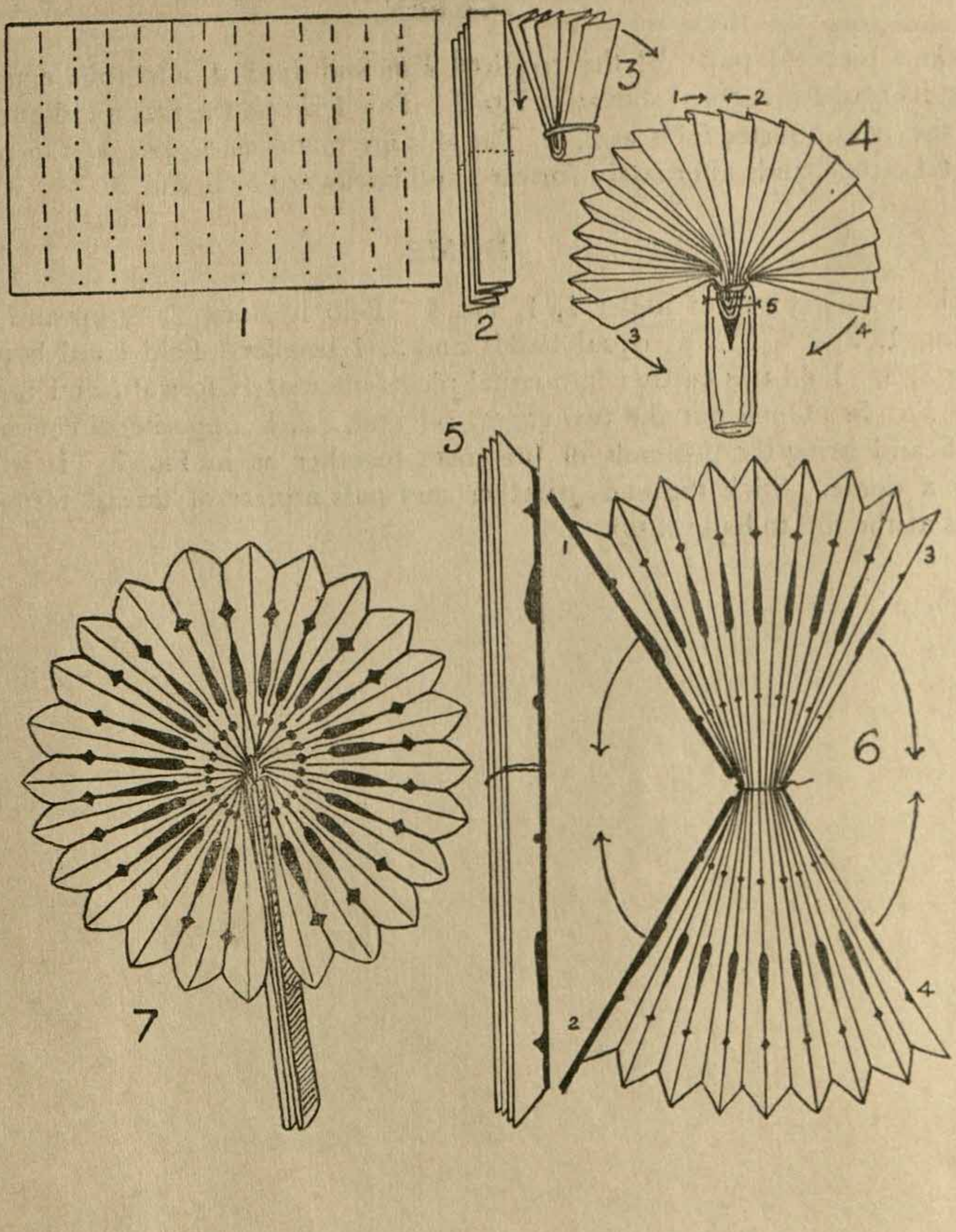
SCREEN

Take a piece of paper of the required size and fold it into four equal parts along its breadth and cut slits as in Fig. **2**. Fig. **1** shows the first middle fold at 1 and the next quarter folds at 2, 2. The slits are made as 3, Fig. **1**. Open it out and take the bands alternately forward and backward as in Fig. **3**.

DOME

Take a long piece of paper 1, 1, Fig. **4**. Fold it along 2, 2, upward to 3, 3 making 1, 2 and 2, 3 as equal bands and 3, 1 smaller. Fold band backwards along 3, 3. Fold this further into equal pleats alternately forward and backward as in Fig. **5**. Open out the two edges, 1-1 and 2-2, in opposite directions as in Fig. **6** and bring the two ends of the sheet together as in Fig **7**. It will then form a dome. Stick the ends together and pass a piece of thread through the pleats at the top to hang it up.

Plate 11

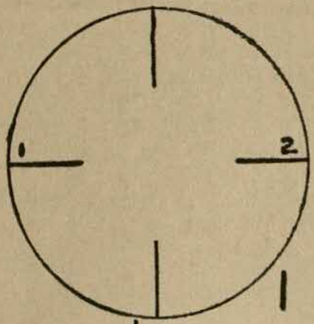


FANS

Take a long piece of paper, FIG. **1**, and fold it into pleats of small widths along the dotted lines as in FIG. **2**. Fold it in the middle and tie it as in FIG. **3**. Stick the ends 1 and 2, FIG. **4**. Fix the middle portion into a split bamboo piece as 5, Fig. **4**. Bring the ends 3 and 4 to the handle and leave them free, so that the fan can be folded and opened at will. When folded, it will go into the pocket.

ORNAMENTED FAN

Fold a long piece of paper into pleats as in FIG. **5**. Cut the ends into the shape shown. Cut also some ornamental forms on the side. Tie it in the middle and stick the ends 3 and 4, FIG. **6** on one side to form one continuous fold. The ends 1 and 2 on the other side should be stuck to two thin pieces of bamboo as shown in FIG. **7**. The fan can be opened and held by the handles when in use. When not in use it can be kept folded.



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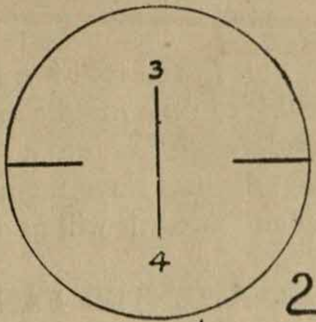

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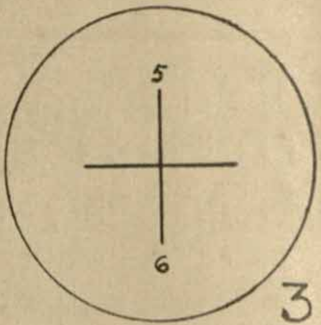

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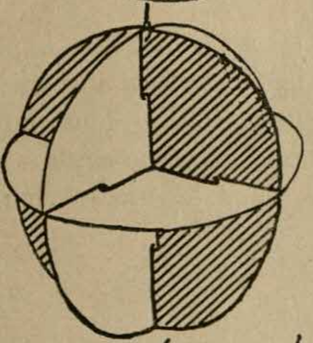

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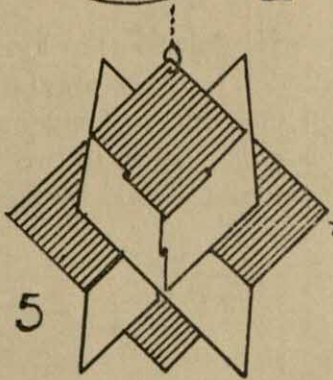

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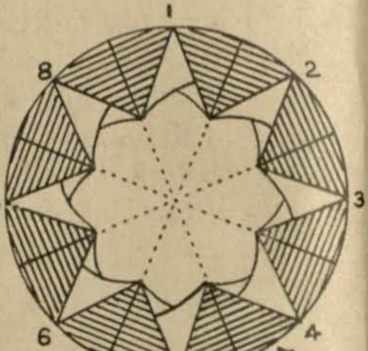

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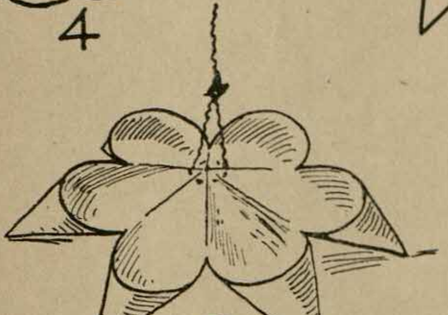

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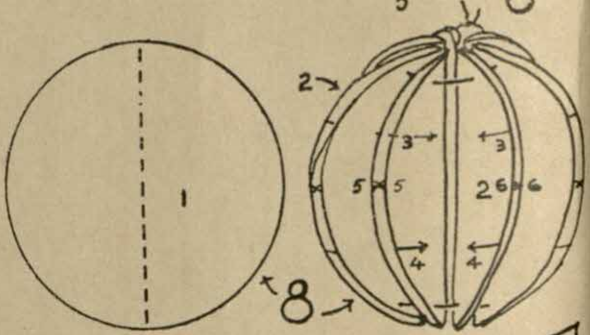

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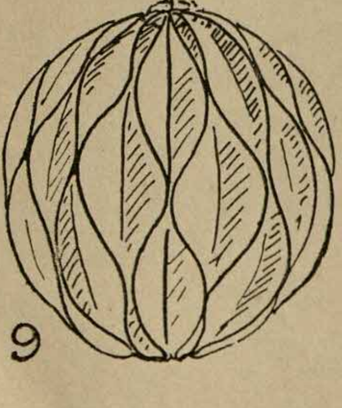

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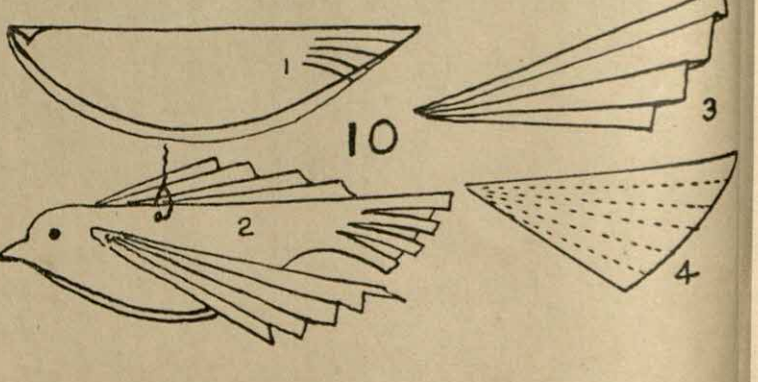

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DECORATIVE HANGER—I

Cut three bits of circles of the same size and cut slits in the manner shown in Figs. **1** to **3**. Fold circle 1 along slits 1 and 2, and insert it through slit 3-4 in Fig. **2** and open it out. Then fold both circles together along slit 3-4 and insert them through slit 5-6 in Fig. **3** and open out along the other slits. You will have an interlocked hanger as in Fig. **4**. The same method may be followed with squares and the result is shown in Fig. **5**. You can hang up these things as decorations. Different coloured papers may be used.

DECORATIVE HANGER—II

Cut a circle in a piece of paper and draw four diameters dividing the circle into equal sectors. Cut half the length of the radii from the edge as in Fig. **6**. Fold the ends of the arcs inwards as shown in 1 to 8. You have now eight cones and they all lie flat. Cut off one cone and put the last cone into the adjoining cone. You will have six cones standing in a pyramidal form as in Fig. **7**. Hang it up as shown.

DECORATIVE HANGER—III

Cut a number of circles of equal size as 1 in Fig. **8** and fold them all into halves along the dotted line 1. Tie them together at the top and bottom as shown in 2. Stick two adjoining edges of two circles at two points as in 3-3 and 4-4, as shown by arrows. Then alternately stick at points 5-5 and 6-6 and continue the process with all the edges. You will have a hanger like Fig. **9**.

FLYING BIRD

Cut a piece of paper and fold it as 1, Fig. **10**, and also cut the beak and tail as in 2. Cut two triangular pieces of paper like 4, and fold them fan-wise along dotted lines as in 3. Stick them to the body of the bird on either side as in 2.

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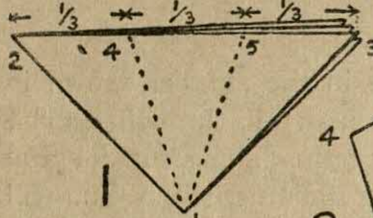

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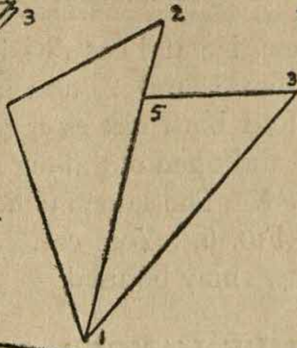

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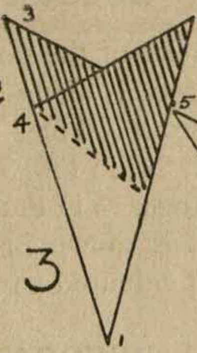

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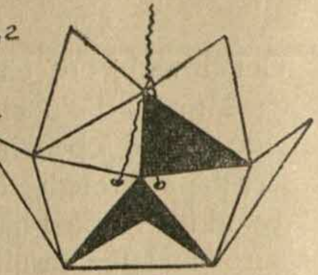

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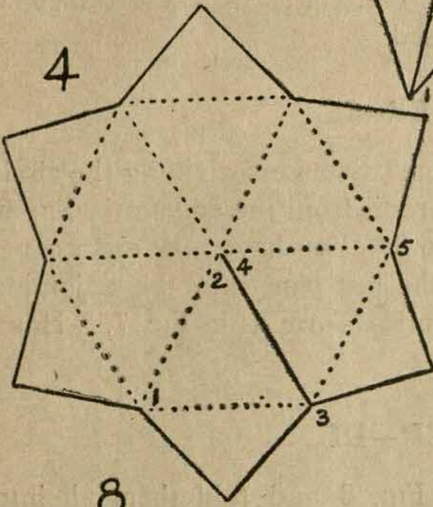

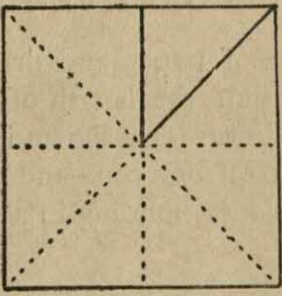

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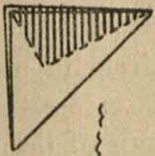

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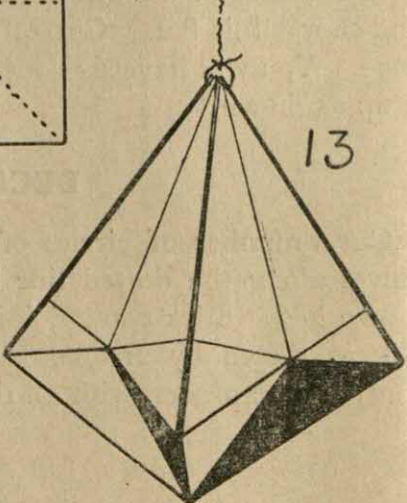

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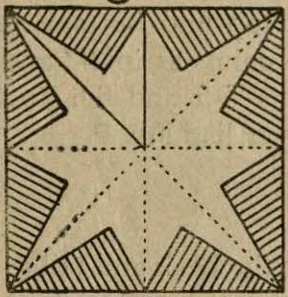

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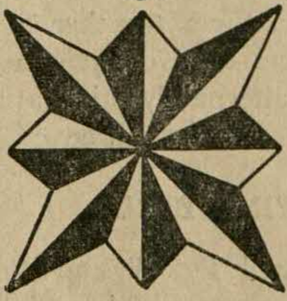

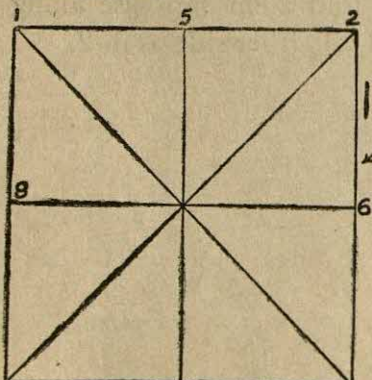

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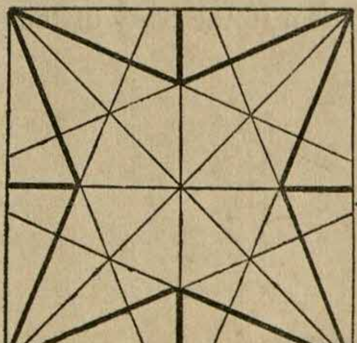

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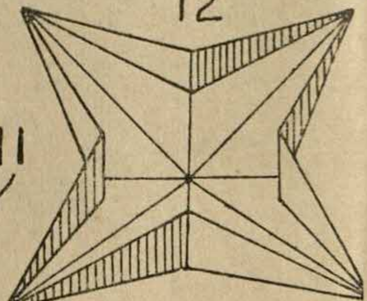


SIX POINT STAR

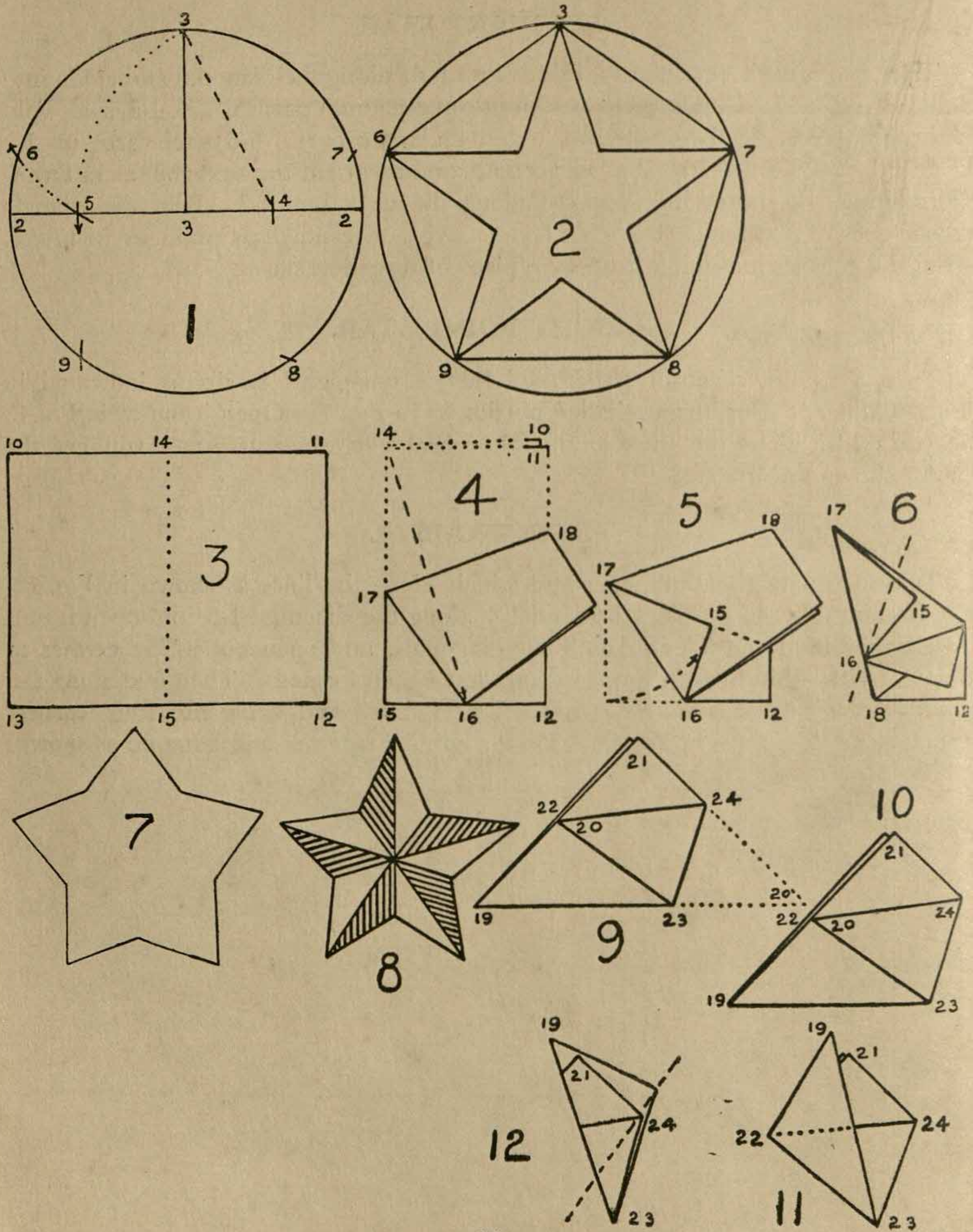
Take a square sheet of paper, fold it into half along the diagonal and again into half, as in Fig. **1**. Divide the edge 2-3 into three equal parts as 2-4, 4-5, 5-3. Fold one part 1-2-4 over 1-5 as in Fig. **2** and the other part 1-5-3 backwards on 1-5 as in Fig. **3**. Cut off the shaded portions and open out the hexagon, as in Fig. **4**. Fold along the dotted lines and cut along the dark line 2-3. Fold the triangle 1-2-3 over the triangle 3-4-5, and you have a five-sided pyramid as in Fig. **5**. Fold the corners and hang it up by a piece of thread as shown.

EIGHT POINT STAR

Take a square sheet of paper and fold it one-eighth its size as indicated in Figs. **6** and **7**. Cut off the shaded portion as in Fig. **7**. Open it out as in Fig. **8**. If you fold it along the lines joining the corners to the centre, you will get the shape shown in Fig. **9**.

HANGING BELL

Take a square sheet of paper and fold it along the lines as shown in Fig. **10**. Open it out. Fold the sides 1-2 and 1-4 along the diagonal 1-3 and open it out. Similarly fold all the sides to both the diagonals, and open out. The creases as shown by the thin lines in Fig. **11** would have been formed. Then fold along the dark lines to emphasise the creases as in Fig. **12** and bring the four corners together at the top as in Fig **13**. Tie the corners together and hang up as shown.



PENTAGON

Draw a circle as in FIG. **1** and draw its diameter 2-2. Draw the perpendicular 3-3 from the centre 3. Bisect 3-2 at 4. With centre 4 and 4-3 as radius, cut 2, 2 at 5. With centre 3 and 3-5 as radius, cut the circle at 6. 3-6 is the side of the pentagon. Mark off points 7, 8, 9 which are the other corners of the pentagon and join 3, 7, 8, 9, 6.

FIVE POINT STAR—I

Join 6-7, 7-9, 9-3, 3-8 and 8-6. You have a star like FIG. **2**.

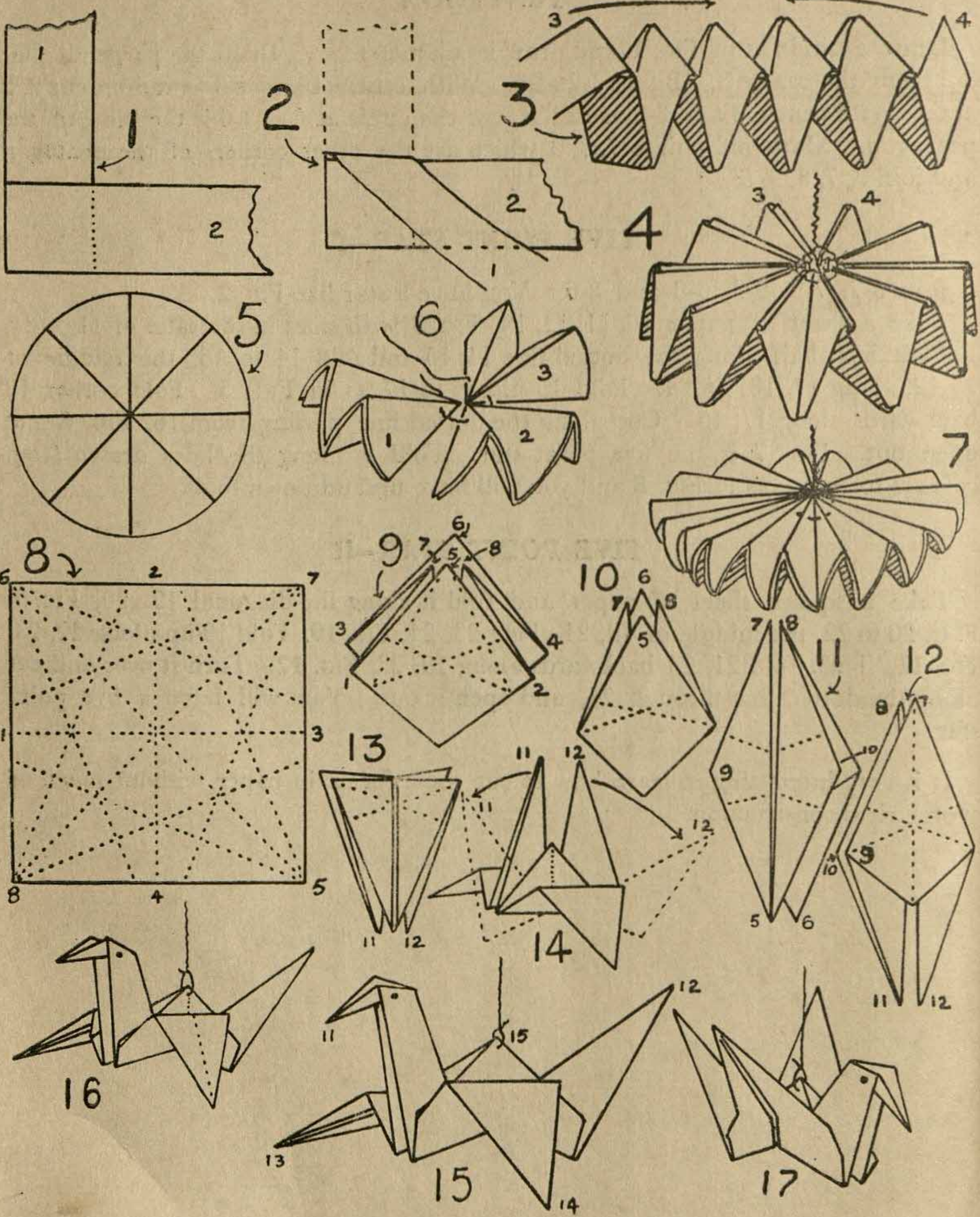
Take a sheet of paper 10, 11, 12, 13, FIG. **3** with sides in the ratio of 11 × 8½. Fold it into half along the dotted line 14, 15 and fold 14 to 16, the middle of 15-12, along 17, 18, FIG. **4**. Fold 15 along 16-17 as in FIG. **5**. Fold corner 18 backwards along 17, 15. Cut along the dotted line passing from 16, FIG. **6** and open out. FIG. **7** is the five point star. Fold it along the lines drawn from corners to centre as in FIG. **8** and you will have up and down folds.

FIVE POINT STAR—II

Take a square sheet of paper and fold it along the diagonal 19, 20, FIG. **9**. Fold 20 to 22, the middle of 19, 21 along 23, 24, FIG. **10**. Fold 19 up along 22, 23, FIG. **11**. Then fold 21, 23 backwards along 19, 23, FIG. **12**. Turn it over and cut along the dotted line through 24, and open it out. You will have a five point star.

It is very interesting to learn how to cut these forms in paper without much of geometrical construction.

Plate 15



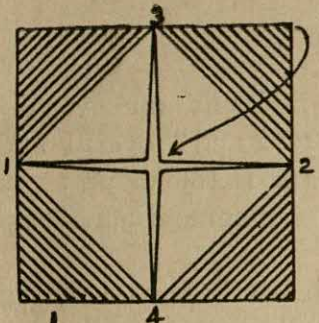
CIRCULAR SHAPES

(1) Take two long strips of paper 1 and 2 and put their ends one over the other at right angles, as in Fig. **1**. Fold 1 over 2 as in Fig. **2** and 2 over 1 and again 1 over 2 and 2 over 1 and so on, till the whole length is folded up as in Fig. **3**. Bring the ends 3 and 4 together as in Fig. **4**. Stick them and hang it up by string.

(2) Cut a number of circles, Fig. **5** and fold each into $\frac{1}{8}$th shape as 1, 2, 3 in Fig. **6**. Thread them, stick them together and form into a cluster as Fig. **7**.

FLYING BIRD

Take a square piece of paper and fold it along the diagonals 5-6 and 7-8 and also along the vertical and horizontal middle lines 1-3 and 2-4. Fold each side to the diagonals and you will have the creases as shown by the dotted lines in Fig. **8**. Bring the four corners together as in Fig. **9**. The dotted lines are the creases. Push corner 1, Fig. **9** inwards making the edge fall along the diagonal inside. Push in the other corners 2, 3, 4 likewise and obtain Fig. **10**. You can easily push these corners inside by pulling the main corners a little away. Fold back the corners 5 and 6, Fig. **10**, to obtain Fig. **11**. Bring together the corners 9 and 10, Fig. **11** on one side and the other two corners on the other side and get Fig. **12**. Bring down corners 7 and 8 to meet corners 11 and 12 on either side of Fig. **12** to get Fig. **13**. Turn it upside down with the corners pointing upwards as in Fig. **14**. Pull out the inside corners 11 and 12 to the position shown by the arrows and the dotted lines. Push down the corner 11 as in Fig. **15** to form the beak. Corner 12 will be the tail. Fold down the remaining two corners, 13, 14, Fig. **15**, to form the wings. Hang it up by the corner 15. Figs. **16** and **17** are more birds.



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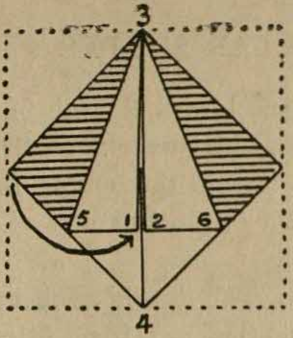

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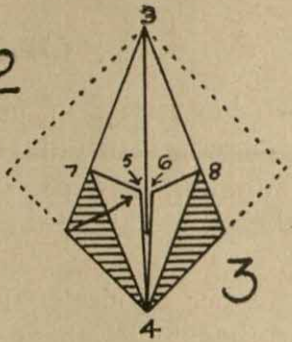

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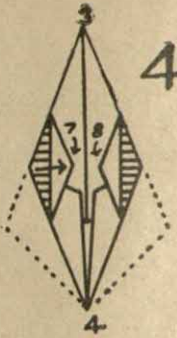

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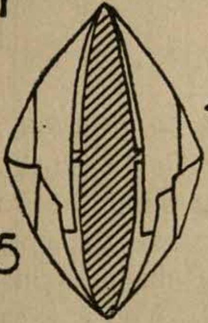

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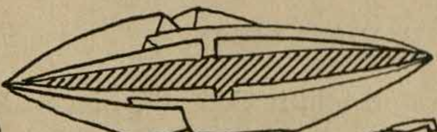

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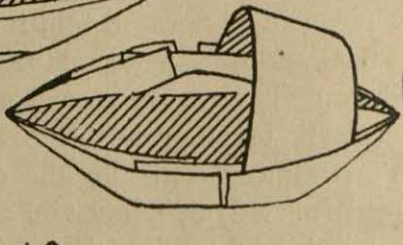

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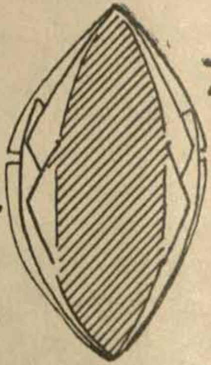

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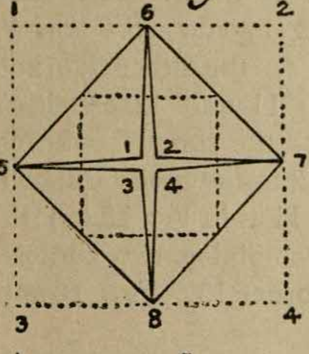

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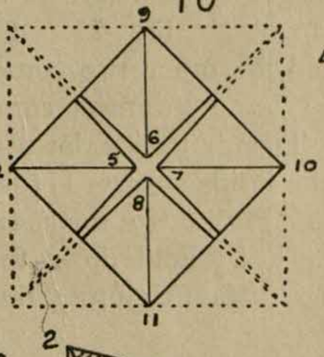

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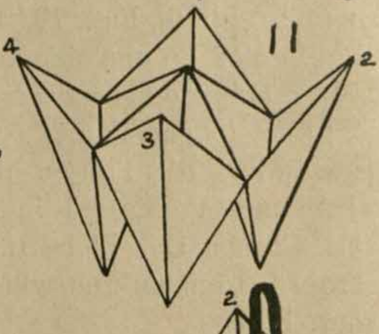

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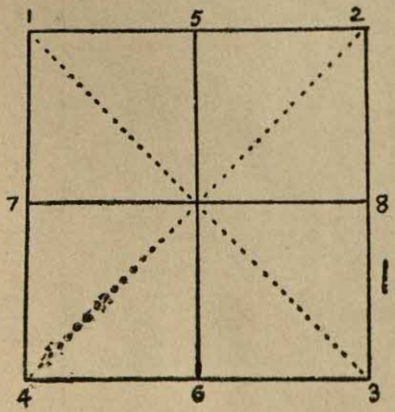

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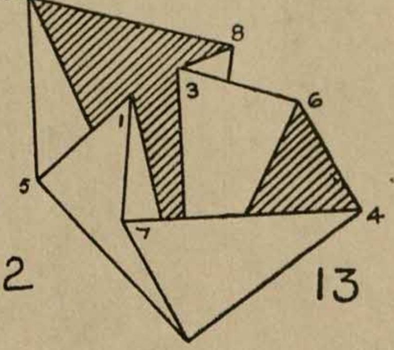

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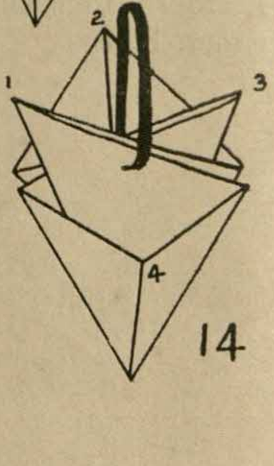

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COUNTRY BOAT

Take a square piece of paper and fold the corners to the centre and corners 1 and 2, FIG. **1**, to the centre again along 3-4 as in FIG. **2**. Again fold corners 5 and 6, FIG. **2** to the middle as in FIG. **3** as indicated by the arrows. Fold corners 7 and 8, FIG. **3** a little towards the middle as in FIG. **4**. Open out along the middle 3-4 as in FIG. **5** and **6**. Hold the right and left sides in both hands with the thumb inside and the other fingers outside and turn the boat inside out, as in FIG. **7**. Fix a roof of paper to the boat as in FIG. **8**.

BASKET—I

Fold all corners 1, 2, 3, 4 of a square to the centre, FIG. **9**. Reverse it and again fold the corners 5, 6, 7, 8 to the centre, FIG. **10**. Reverse it again, hold corners 9, 10, 11, 12 together underneath, and open out the corners 1, 2, 3, 4 as in FIG. **11** and you have a basket.

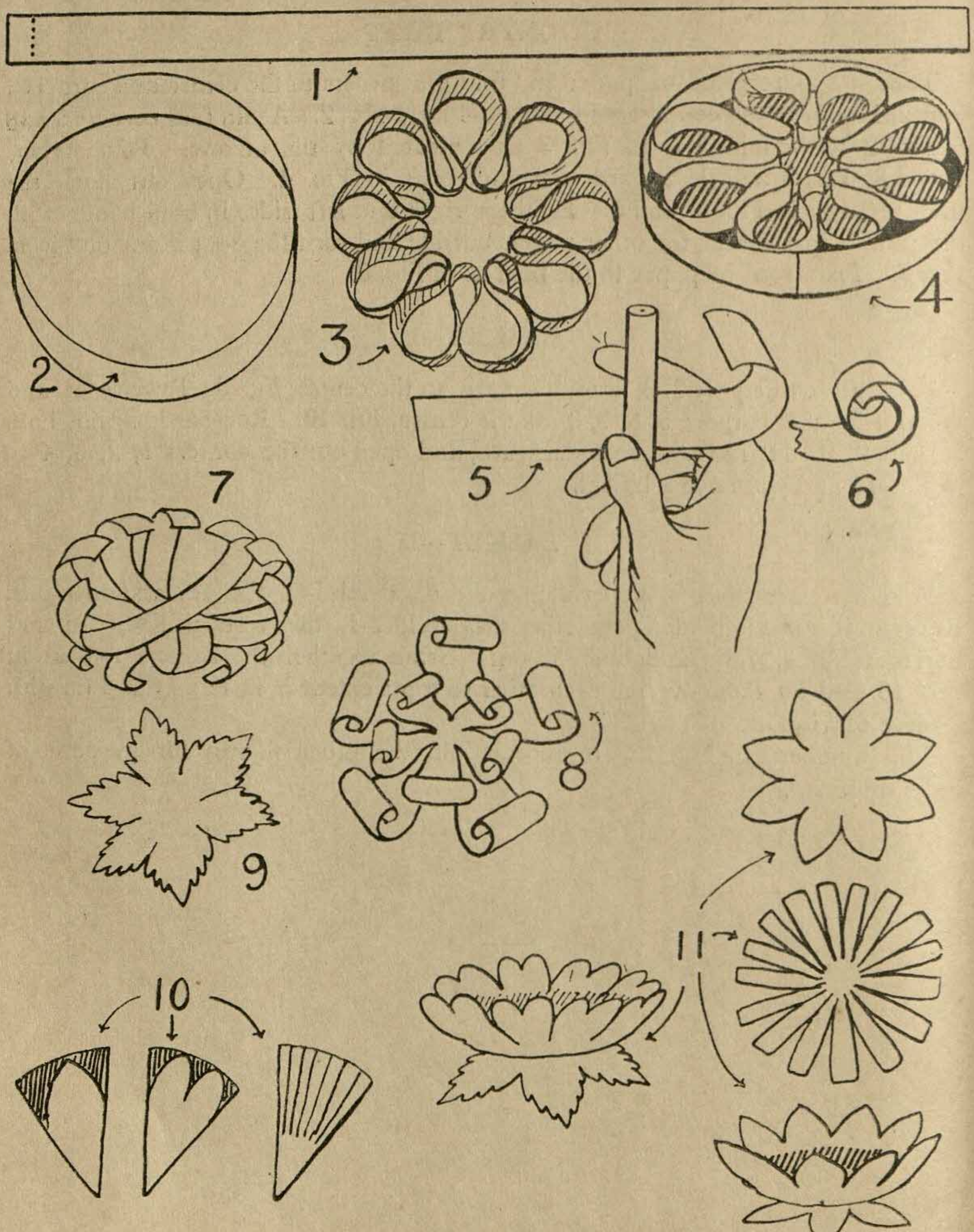
BASKET—II

Fold a square piece of paper along one diagonal 1-3, FIG. **12**, and open out. Reverse it and fold along the other diagonal, 2-4, the vertical line, 5-6 and horizontal line, 7-8, and open it out. Bring together the corners 1, 3 as in FIG. **13** and let them overlap each other to some extent as in FIG. **14** and tie with a piece of ribbon.

The numbers in FIG. **12** are repeated in the other figures for purpose of indentification.

Plate 17

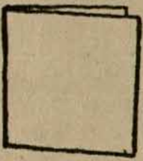
PAPER WORK



FLOWERS

Take a long narrow strip of paper as in FIG. **1** and make it into a ring as in FIG. **2**. Take another very long strip, make it into foils as in FIG. **3** and put it in the ring as in FIG. **4**. Stick the outer bends of the foils to the rind.

To make a paper-strip-coil, hold a strip and a pencil in your hand as in FIG. **5**. Press the pencil against the strip and draw the pencil to the end. A coil is formed at the end. Repeat this two or three times, and the coil becomes well formed. If a closer coil is required roll the paper well and release it as in FIG. **6**. Make several paper coils like this and arrange them as in FIG. **7** and stitch or stick them in the centre. If you arrange more and more smaller coils in the centre, it will look like a real flower. In FIG. **8** a circle is cut into sectors and the sectors are coiled. A smaller circle is cut in the same manner and put in the centre. FIG. **9** is a pattern for the sepals of a flower. Fold a circle into eighths and cut as in FIG. **10** and open it out. FIG. **11** shows different types of flowers.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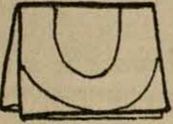
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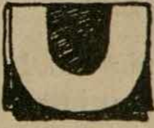
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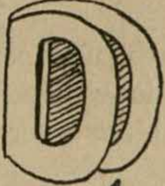
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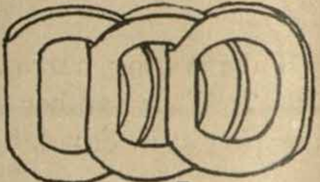
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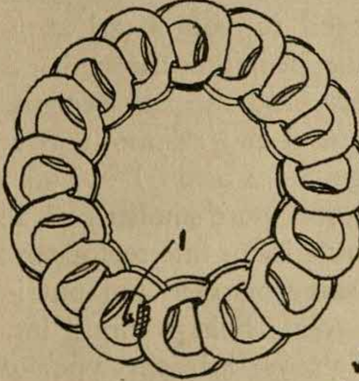

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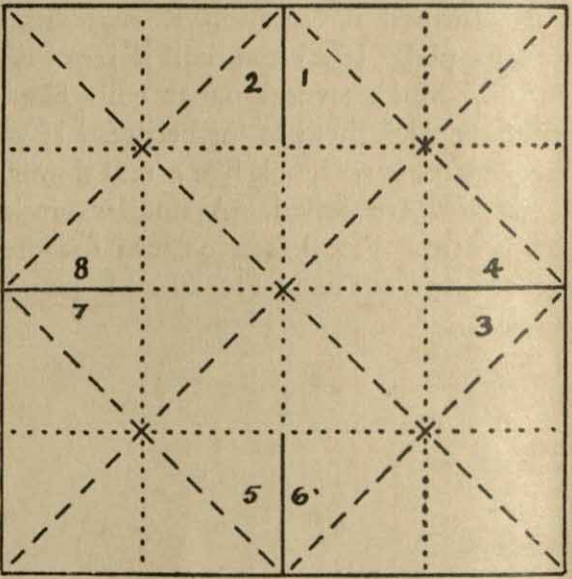

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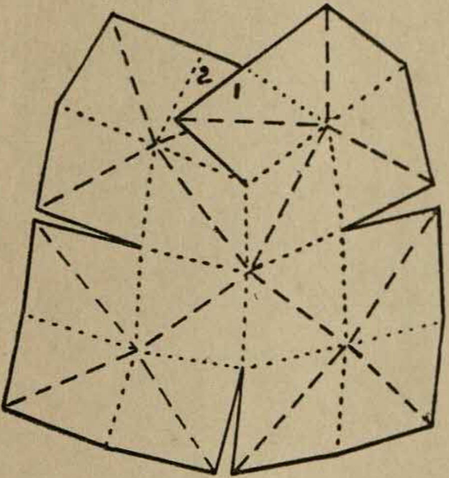

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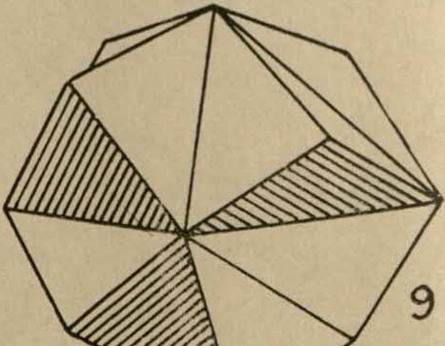
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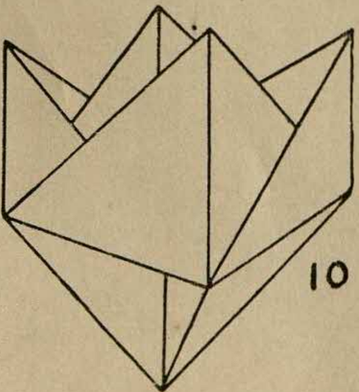
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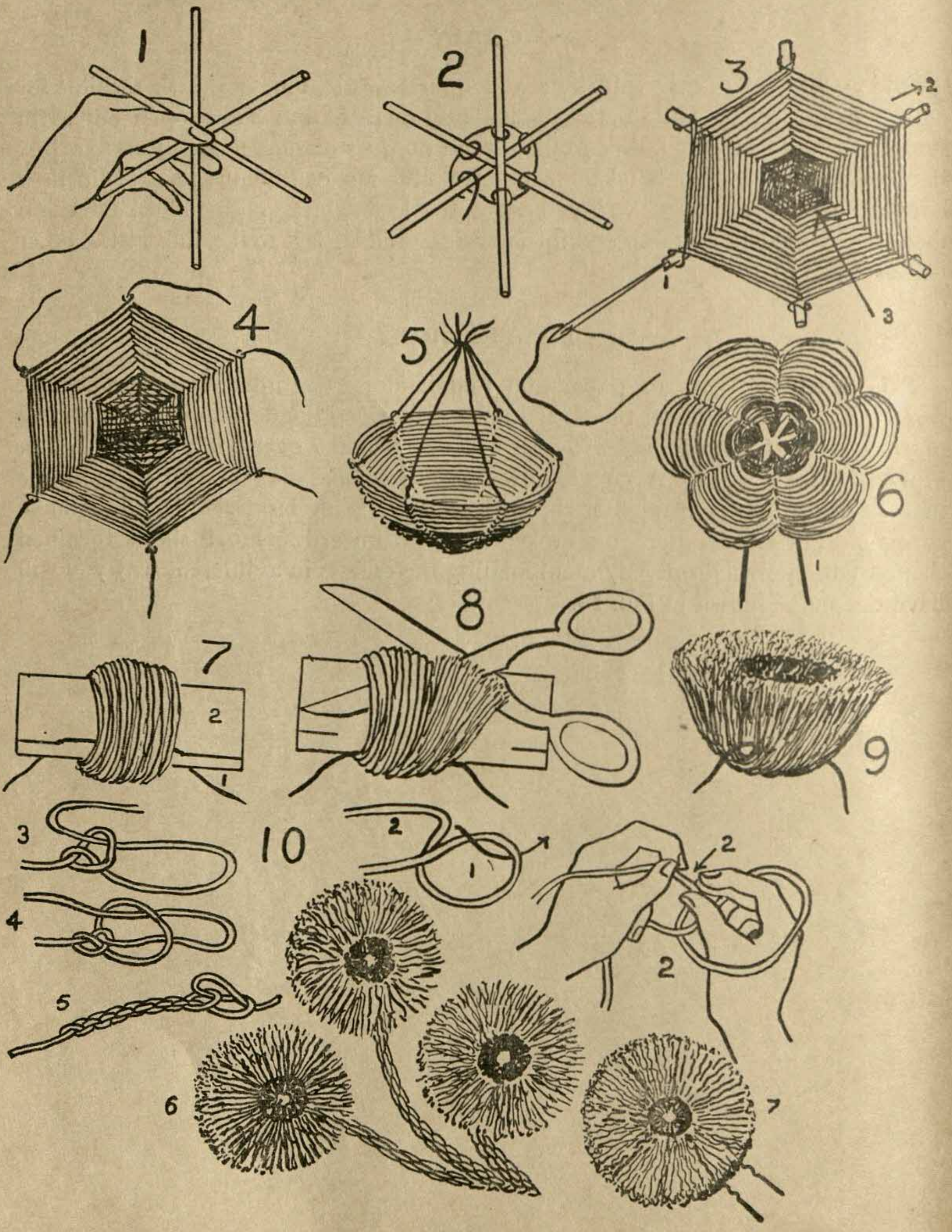
CHAIN

Fold a piece of paper into half and quarter as in FIG. **1**. Mark the line for cutting as in FIG. **2**. Cut off the shaded portion as in FIG. **3** and open out as in FIG. **4**. This forms one link. Make a good number of such links. Put one link into another as in FIG. **5**. You can have either a continuous long chain or a circular one as in FIG. **6**. If you want the latter, bring both ends of the chain together, cut the link at one end into its wings and stick it to the link at the other end as 1 in FIG. **6**.

POLYHEDRON

Take a square piece of paper and fold it along the broken lines on one side, reverse it and fold it along the dotted lines. Cut along the dark lines in the middle of the sides. Cover 1 over 2, 3 over 4, 5 over 6 and 7 over 8 of FIG. **7** as 1, 2 in FIG. **8** and stick them. A cup is now formed. Make another cup in the same manner and insert it in the first cup with its edges going inside. Stick all the loose corners. The creases along the broken lines go inwards. FIG. **9** shows the final shape of the polyhedron. By manipulating the creases in a different way you will have the shape shown in FIG. **10**.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WOOLLEN FLOWERS—I

Woollen flowers are easy to make and they look very realistic. Take three bits of broom stick about 3 inches long and hold them in your left hand as in Fig. **1**. Take a woollen thread of any colour you like and wind it round each bit as in Fig. **2**. At first you may use a woollen thread of any dark colour to represent anthers as 3 in Fig. **3** and then a lighter colour for petals. Wind as much thread as you want according to the size of the flower you desire, say, about 3 inches in diameter, as in Fig. **3**. When the winding is finished, tie the end of the thread to one end of one of the sticks. Take some cotton thread on a needle, fix it into one stick as 1 in Fig. **3** and pull it out at the other end 2 in the direction of the arrow. Now the thread is substituted for the stick. Repeat the same with the other two sticks and thus you have pieces of thread in the place of sticks as in Fig. **4**. Collect the six ends of the pieces of thread and tie them together as in Fig. **5**. You will notice that one side is the right side and the other the wrong side. Turn the right side inwards so that it is in full view as in Fig. **6** and fix a hair-pin behind.

WOOLLEN FLOWERS—II

Take a piece of card about an inch broad and cut slits as 1 in Fig. **7**. Pass a piece of thread through these slits. First wind some brown wool round the card as 2 in Fig. **7**. Then wind more wool of a different colour and cut it as in Fig. **8**. Remove the card as in Fig. **9** and tie the whole bunch tightly. Spread out the strands of wool as 6 in Fig. **10**.

CHAIN OF WOOL

Take some wool and have it as 1 in Fig. **10**. Draw out 2 through 1 as shown by the arrow. Through this loop draw out fresh thread as in 2—2 and go on repeating the same as in 3 and 4 till you get a sufficient length of chain as in 5. When you want to finish the chain, pull out the end completely so that the chain cannot be undone by any pulling at the end. You can use this chain as the stalk for the flowers in 6. A flower with a hair-pin attached is shown in 7.

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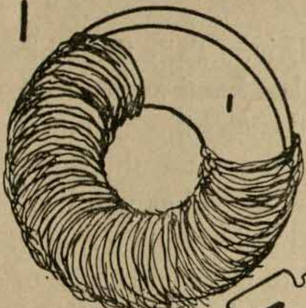

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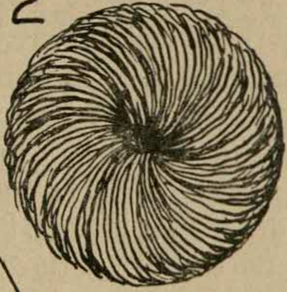

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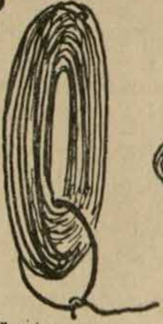

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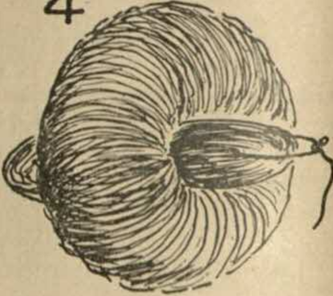

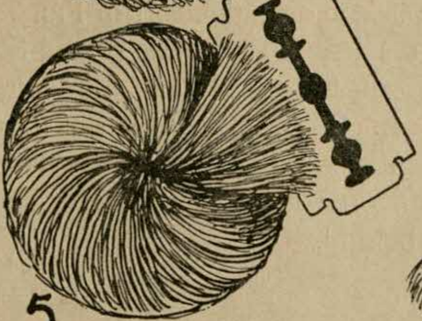

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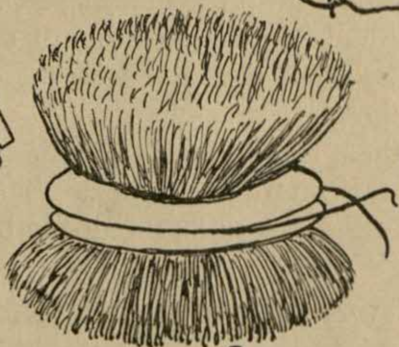

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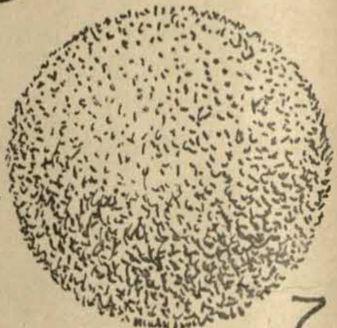

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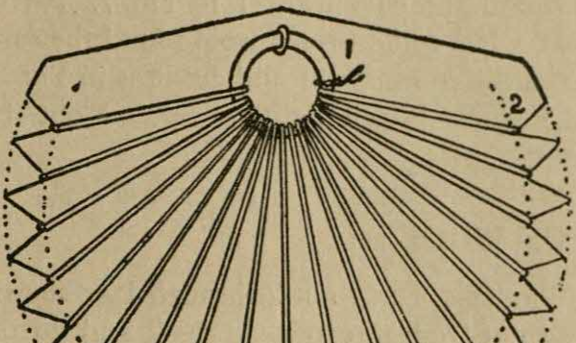

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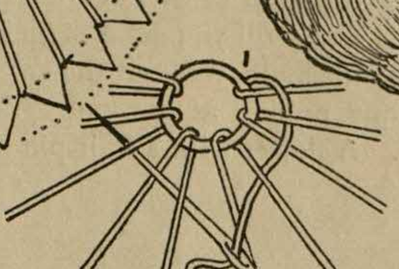

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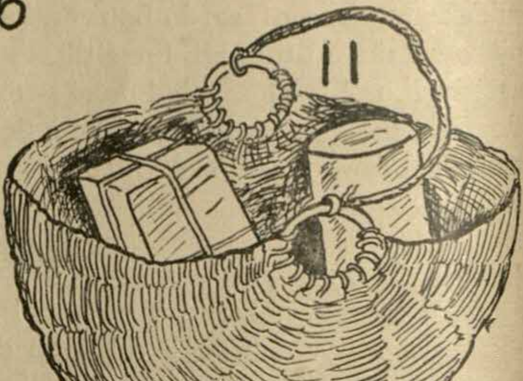

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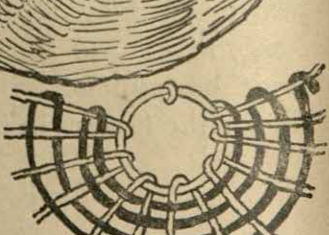

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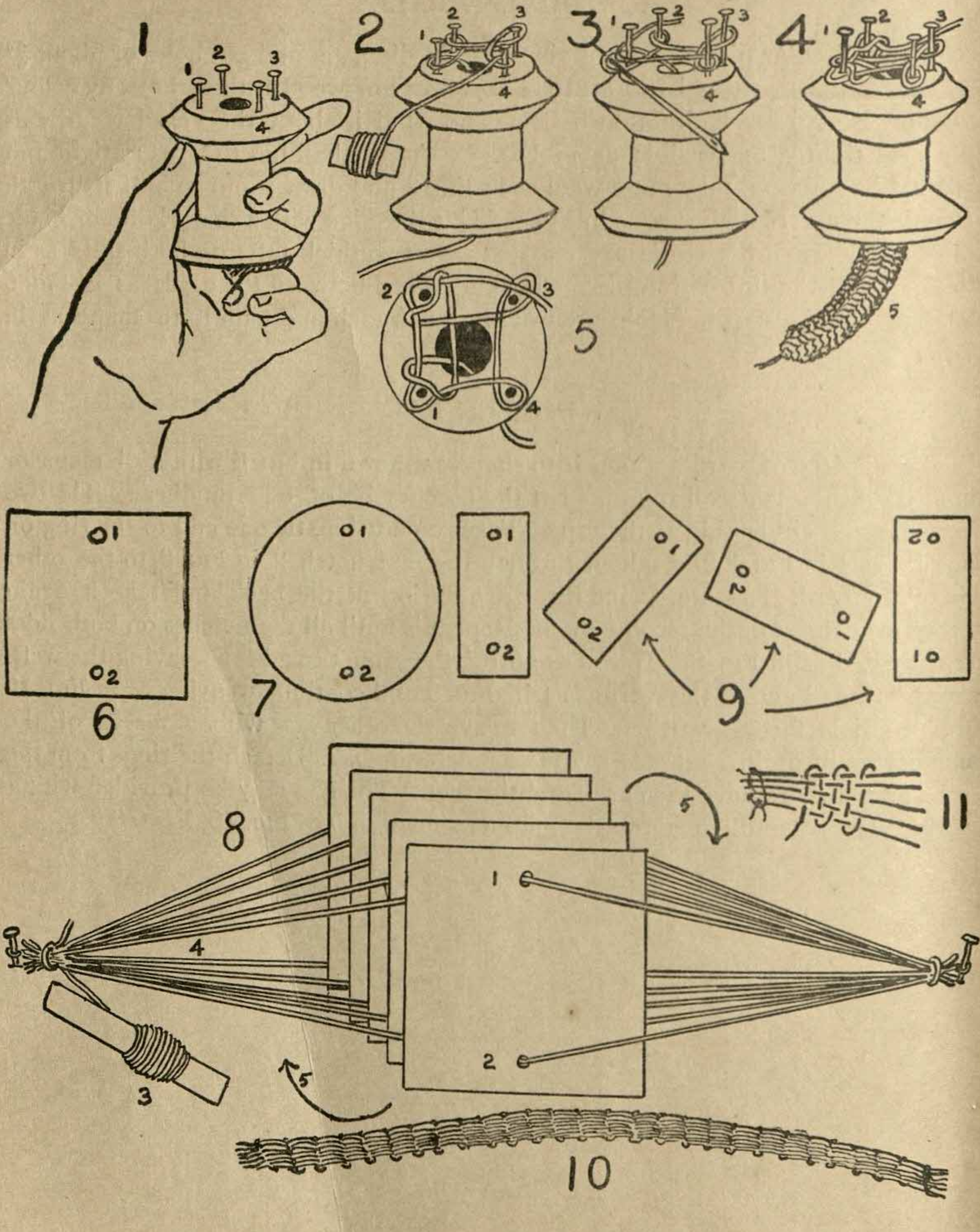
WOOLLEN BALL

Cut two circular pieces of card about $2\frac{1}{2}''$ in diameter and cut holes of about $\frac{3}{4}''$ diameter in the centre as 1 in Fig. **1**. Take plenty of woollen thread of any colour — yellow is used for badminton balls — and wind it about the circular cards as fully and tightly as possible as in Fig. **2**. As the ball has to be very tight and hard for badminton, take more wool as in Fig. **3** and draw it out to half its length through the centre of Fig. **2** as in Fig. **4**. Cut the edge with a sharp knife or blade as in Fig. **5**. Then the cards are exposed with two thick tufts on both sides as in Fig. **6**. Bind the tuft with a piece of twine passed between the cards as in Fig. **6** and tear off the cards. Hold the wool in one bunch and trim it to shape as in Fig. **7**.

WOOLLEN BAG

Take a piece of card and cut it to shape as shown in Fig. **8** with a diameter or about 8″ with notches all round. Let the notches be of odd numbers. Tie two ivory rings on either side at the top. Take some twine, tie one end to the ring on one side as 1 in Fig. **8** and take it through the first notch 2 in Fig. **8** to the other side of the card. Pass the twine through the ring at the back and take it again to the front through the second notch. Repeat it until all the notches on both sides are threaded as in Fig. **8**. If you are using the same thread for weaving the weft, take the thread across the warps as 1 in Fig. **9** and continue weaving as in Fig. **10** till the whole face is woven. Then weave the other face with a thread of the same colour or a different colour and complete the bag. Detach the rings from the card and gently remove the card from the bag. The bag may be provided with a lining. Tie a handle made in the manner shown in 5 of Fig. **10, Plate 19.**



WATCH CHAIN IN WOOL

Take a wooden spool used for winding thread and fix four small nails in a square on its top as 1, 2, 3, 4 in FIG. **1**. The length of the nails above the reel may be only about 3/8 inch. Hold the spool in your left hand and pass the end of the woollen or cotton thread down through its hole. Pass the thread that is above the spool, round the four nails as 1, 2, 3, 4 in FIG. **2**. After the thread is taken round the fourth nail, take it outside nail 1, and lift up with a pin the first laid loop of thread and take it over the second loop and put it inside the nail as 1 in FIG. **3**. Then pass the thread round the second nail and lift up the lower loop and take it over the first loop as before and drop it inside. Repeat the process with all the nails and continue the method. As you go on doing this, a woven chain comes out at the bottom of the spool as 5 in FIG. **4**. In FIG. **5** the four dots are the nails and you will see how the thread is passed round. When a sufficient length of chain is thus made, take off the loops from the nails passing the loose end of the thread through each loop and tighten it with a knot.

TAPE WEAVING

Take a number of cards and make two holes in each of them, at the top and bottom edges as 1 and 2 in FIG. **6**. The shape of the cards may be rectangular or circular as in Fig. **7**. The holes must occupy exactly the same position in all the cards. In this lesson, five cards are shown. If the number of cards is more, the tape should be wider. Take long pieces of thread and pass two pieces through the holes 1 and 2 of each card, as in FIG. **8**. These form the warp. When threads are passed through all the cards, gather their ends on both sides and tie them up tightly to two nails or the legs of a bench or table. The threads may be of different colours, and the tape woven with threads of different colours arranged in different ways will show different designs. Take a good quantity of thread on a piece of wood or card as 3 in FIG. **8**. This is called the shuttle. Take the shuttle through the gap 4 in FIG. **8** to the other side and press it close to the end of the warp. Then gently turn all the cards together in the direction of the arrows marked 5 in FIG. **8** until the holes marked 2 come up and the holes marked 1 go down as shown in FIG. **9**. Then pass the shuttle again through the gap and press the weft close to the first laid line. Then reverse the position of the holes by rotating the cards. Care should be taken that this rotation of the cards is done alternately from right to left and left to right. The manner of weaving is shown in FIG. **11**. As the tape is formed at one end, move the cards gradually to the other end, and remove them finally. The length of warp is determined according to the length of tape desired. FIG. **10** shows the finished tape.

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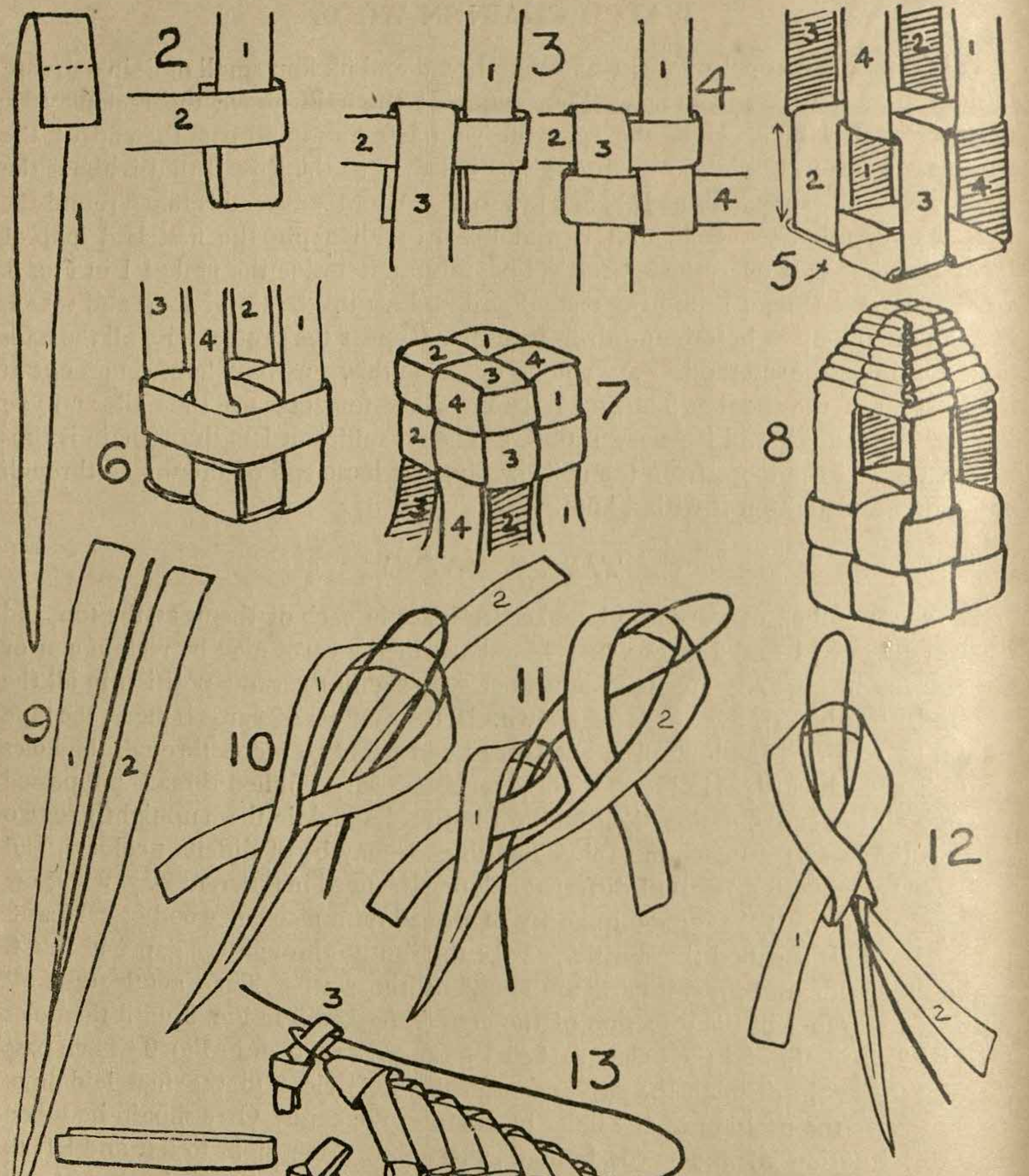
Plate 22 RATTLE—PARROT



RATTLE

The leaf of the palmyra palm is very useful in many ways. It is made into baskets, fans, mats, bags etc. It also lasts very long. The rattle is a toy made of palmyra leaf and is a source of earning a few naye paise or some rice for the gypsies.

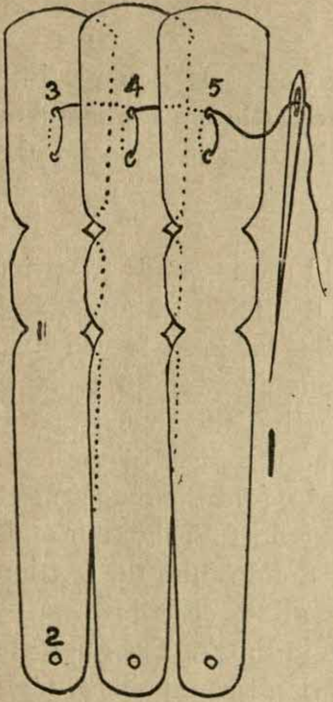
Take four strips of the leaf, of uniform breadth and fold the top ends at twice the breadth of the strip as in FIG. **1**. Put one strip into the fold of another as 1 and 2 in FIG. 2. Put a third strip downwards as 3 in FIG. **3**. Take the fourth strip and fix it as 4 in FIG. **4**, holding 3 in its fold and going through the fold of 1. Note that all the long ends of the strips are in the clockwise direction and that a mat is formed in the centre. Then lift up the long ends along the edges of the mat. Making the height equal to double the breadth of the strip, fold them again one by one and pass the last strip under the first one and again fold the four ends upwards as in FIG. **5**. Take two more leaves and wind them round the portion marked by the arrow in FIG. **5** as shown in FIG. **6**. Then fold all the ends downwards and weave them into the horizontal pieces wound as shown in FIG. **7**. The numbers will show the course of each leaf. Invert them and, allowing for some height, go on weaving them as before into a tower as in FIG. **8**.

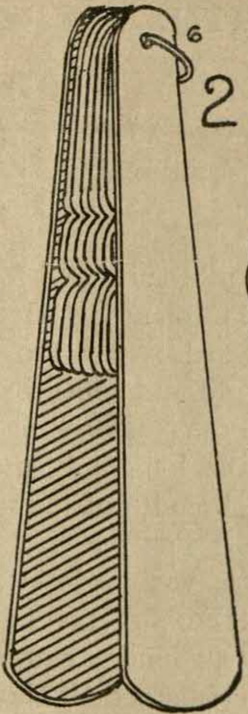
PARROT

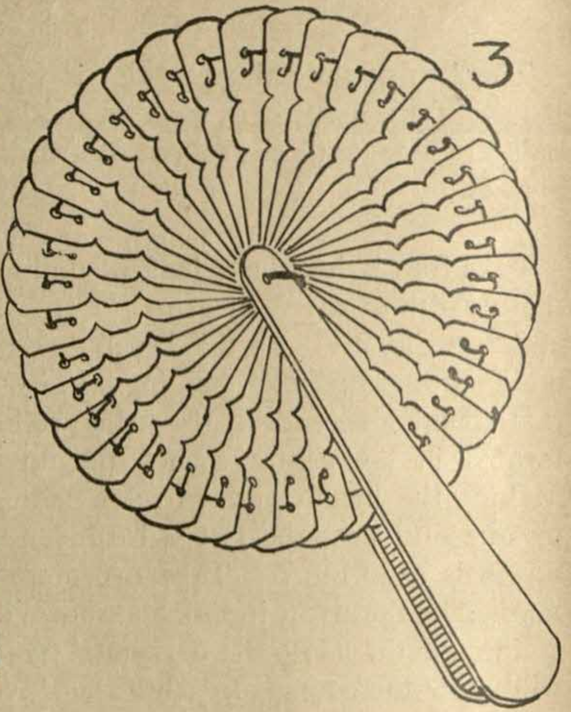
This toy is made of a coconut leaflet. Take one leaflet with the mid-rib and separate the rib upto a small length from the tip as shown in 1 and 2 in FIG. **9**. Bend the rib towards the tip and take strip 1 round the bent rib as 1 in FIG. **10**. Pull it down to the point where the rib is still attached to the leaf as 1 in FIG. **11** and take 2 round in the opposite direction as in the figure and pull it close to 1. Then take 1 again, bend it, take it round and pull it close to the previously laid winding as shown in FIG. **12**. Repeat the process alternately till you have only a small portion of the ends left, as 4 in FIG. **13**. These are the legs. Take a small narrow strip of leaf about $\frac{1}{4}$ inch broad and 3 inches long, fold it as 1 in FIG. **13** and knot it as 2 to serve as the head and beak. Pass it through the bend of the rib as 3 and take the end of the rib through the fold as shown.

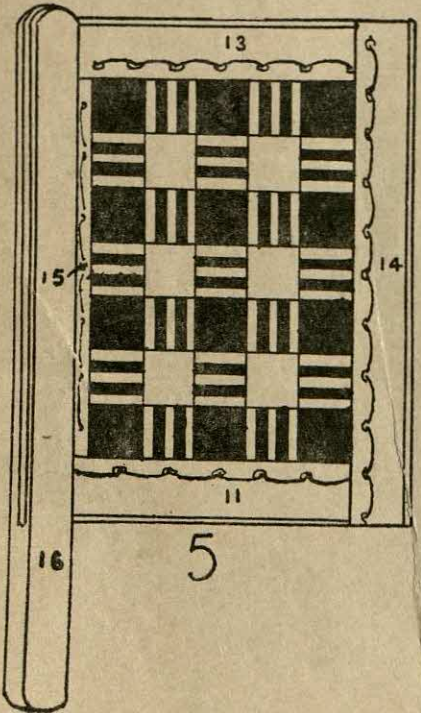
Plate 23

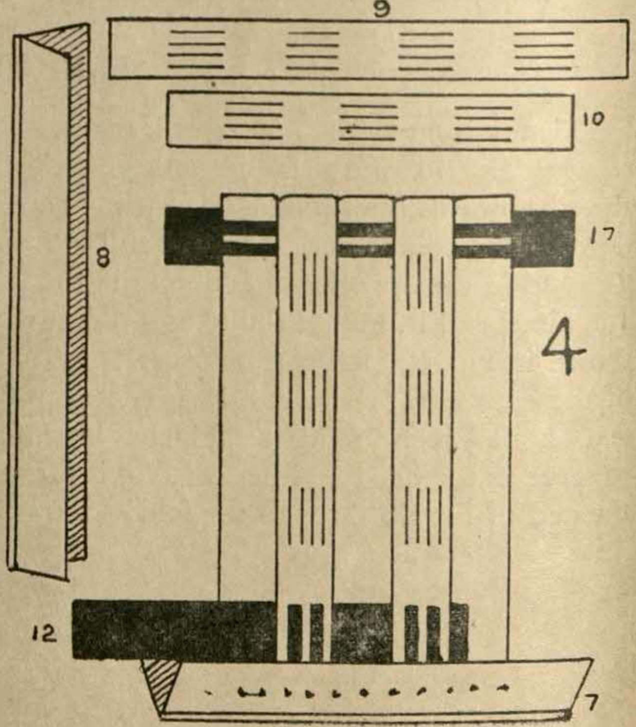
PALMYRA LEAF FANS











FOLDING MODEL

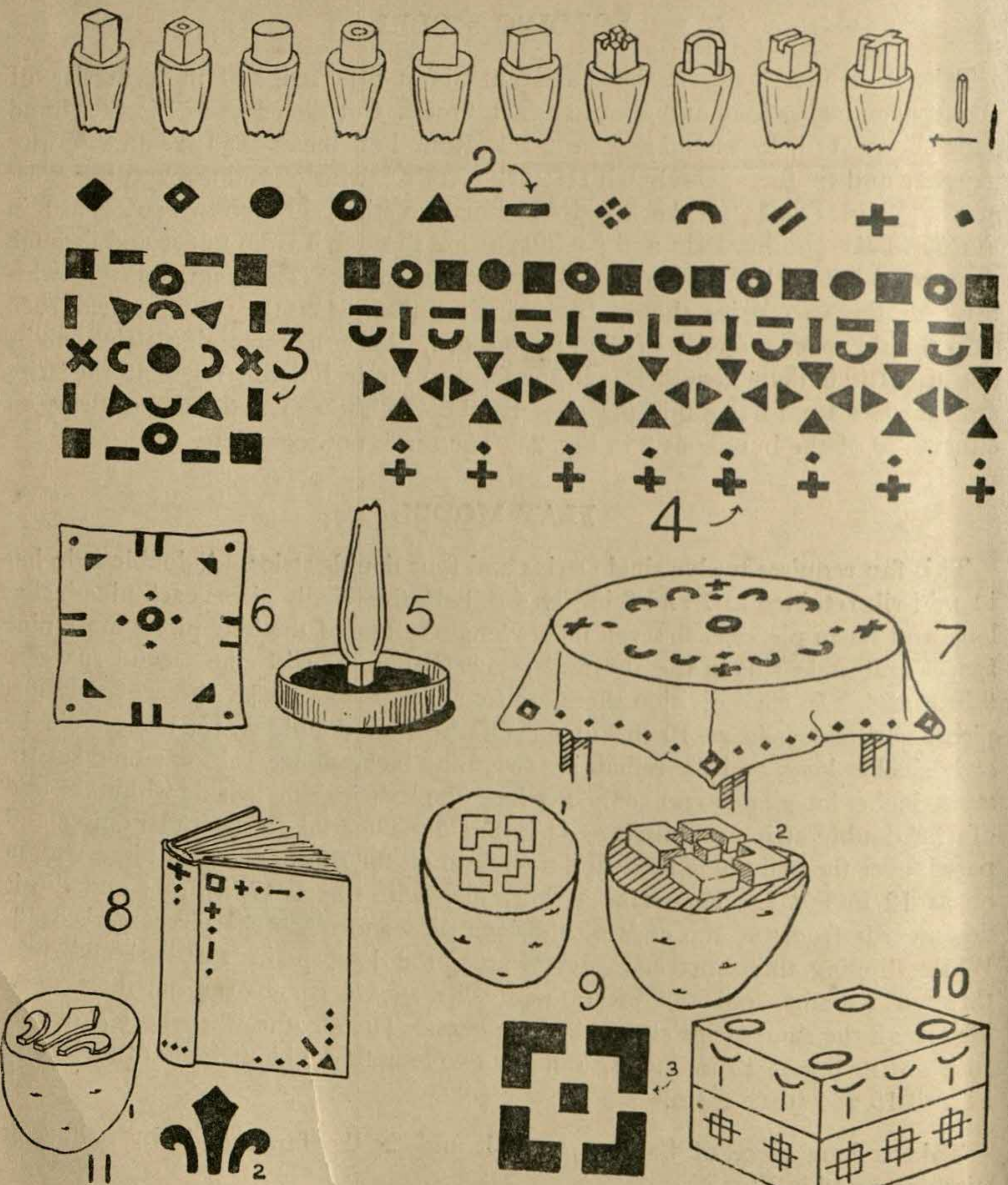
Take a tender palmyra leaf and cut about fifty strips of uniform size of about seven inches long and about an inch broad. Cut the edges as 1 in Fig. **1** and punch holes at the lower end as 2 in Fig. **1**. Round off the ends. Take all the strips together and tie them loosely with a thick piece of twine passed through the holes marked 2 in Fig. **1**. Take a strip and make a stitch through two points as 3 in Fig. **1**. Take another strip and pass the twine through 4 from under and through the second hole below and again take it out through 4. The length of the twine between the two strips should be limited, so that, when the fan is opened, each strip should cover the edge of the previous one. Take the remaining strips one by one and stitch them together as in the finished fan in Fig. **3**. When all the strips are thus tied up, fix two thin pieces of bamboo to the top and bottom strips on either side of the bundle as 6 in Fig. **2**. The fan is now complete.

FLAT MODEL

This fan requires twelve single strips and four double strips. A double strip has its mid-rib retained as 7 and 8 in Fig. **4**. Take five single pieces each nine inches long and seven pieces each seven inches long. In two of the long pieces mark nine spaces and make slits in the alternate spaces, beginning with the second space as 9 in Fig. **4**. In each division there are four slits. Then take three of the short pieces and make slits as 10 in Fig. **4**. Of the four double strips, two should be seven inches long, and the remaining two, nine inches long. Take one double strip seven inches long and arrange the five long single strips side by side within the fold of the double strip and stitch as 11 in Fig. **5**. Then take a short plain piece and pass it over the plain long piece and then through the slits of the next piece and so on as 12 in Fig. **4**. Then take a short strip with slits as 17 in Fig. **4** and slip it downwards from the top ends of the long pieces to reach the piece marked 12. While slipping this short strip downwards, the long plain strips should pass through its slits and the pieces with slits should come over the short ones. Weave all the short strips across the long ones. Then fix the other short 7″ double strip on the top as 13 in Fig. **5**, and the two long 9″ double strips on the sides as 14 and 15 and stitch them.

Take a long piece of bamboo, split it and fix the fan into it by nailing or stitching as 16 in Fig. **5**.

Plate 24 STICK—POTATO PRINTING

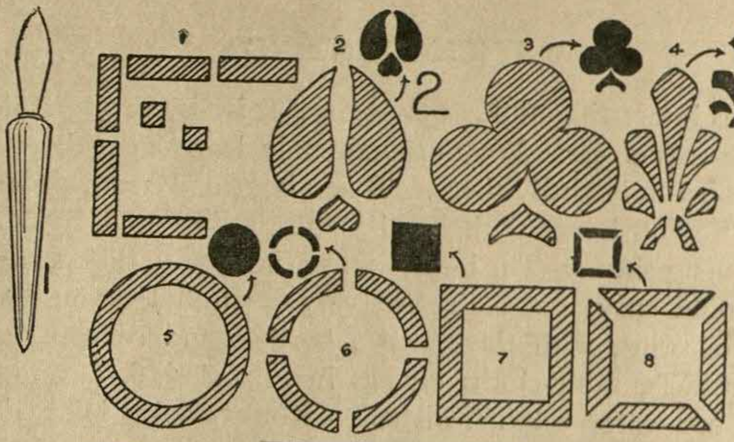


STICK PRINTING

Stick printing is interesting and easy to learn. It is also very useful in decorating note-books, book-covers etc. We must not only learn to make things of some utility but also learn to beautify them. Take about a dozen wooden pen-holders and carve out different shapes at their thick ends, as in FIG. **1**. Even a match stick can be used for such printing. The impressions printed with these sticks are shown in FIG. **2**. You should carve out the figures very carefully lest you should hurt your fingers. You can print, with these sticks, borders and central designs on your book-covers, kerchiefs, table-cloths etc. as in FIGS. **3, 4, 6, 7,** and **8.** For book-covers you can use water colours, oil colours or stamping ink. For printing on cloth, you must use non-washable dyes. Prepare a pad of any of these colours as in FIG. **5**, and press the stick on it and print designs on any desired material. FIG. **10** shows an example of a box decorated with stick printing.

POTATO PRINTING

The same method can be adopted in potato printing. The potato is soft and easy to cut. Cut a design as 1 and 2 in FIG. **9.** The print is shown in 3, FIG. **9.** In Potato printing, as you have a broader area in the cut surface, you can carve bigger designs like leaves, flowers etc., as 1 and 2 in FIG. **11.**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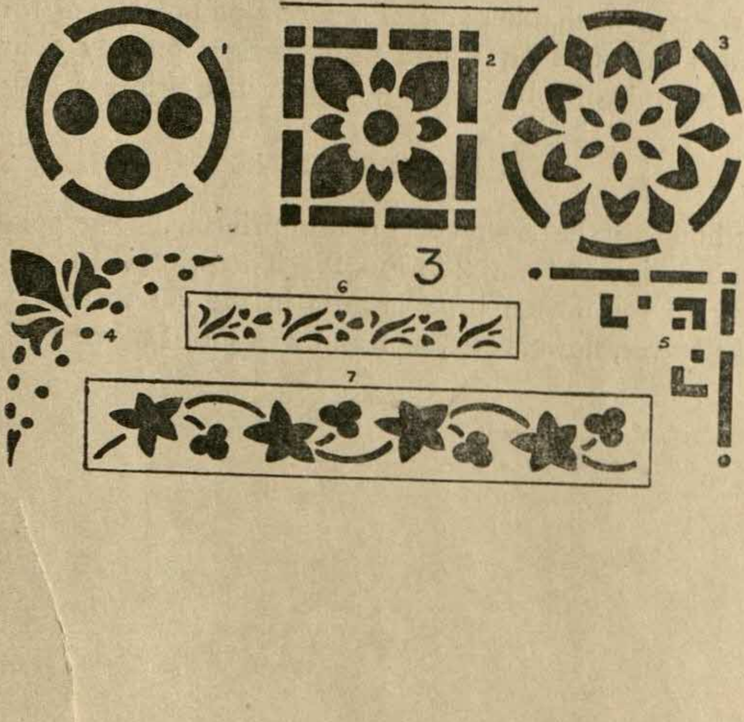
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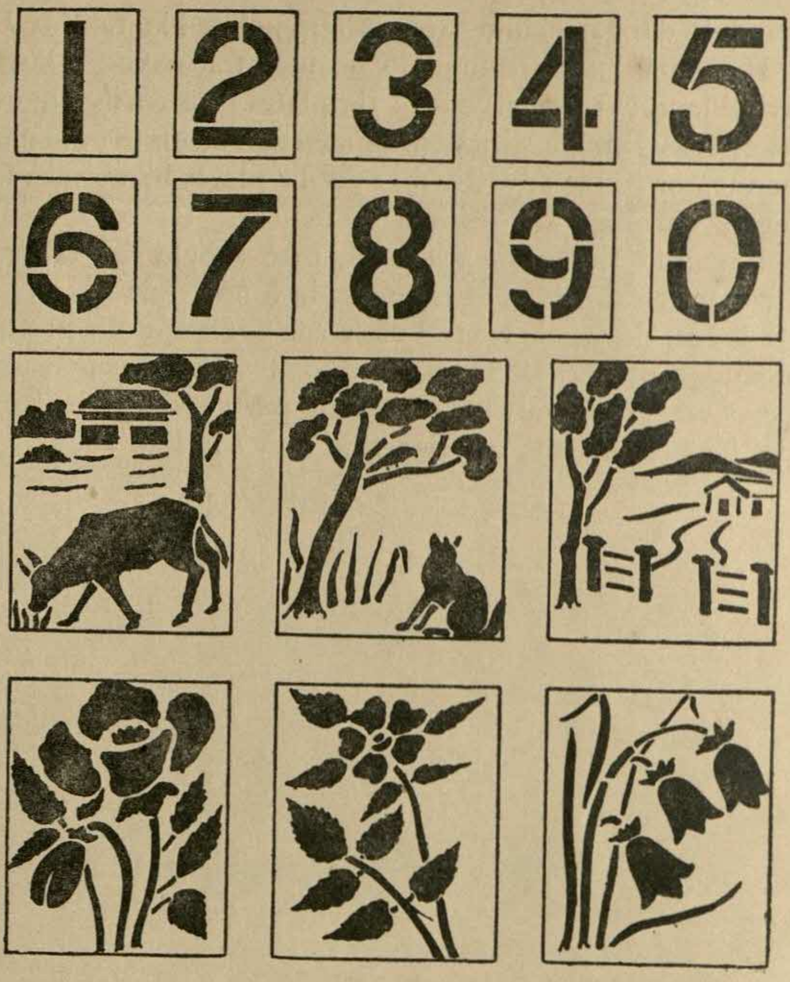
The articles required for stencilling are, a sharp pointed knife, FIG. **1**, card-board and colours. If stencils are required to be used for making a large number of prints, it is advisable to cut stencils out of tin plates. Stencils are used for decorative purposes or for writing instructions or advertisements in public places. You would have seen tea or coffee advertised in public places by means of stencils. In railway carriages, warnings are printed in stencils. In FIG. **2**, items 1 to 8 give examples of stencils. In cutting a stencil, care should be taken to see that connecting pieces are retained. For example, in 5 and 7 in FIG. **2**, if the inner circle or square is cut, the whole central piece comes off and the prints can only be big circular or square patches as 5 and 7 in FIG. **2**. So, provide connecting pieces in suitable places and cut out only the remaining parts as shown in 6 and 8. Designs of various types for borders etc., are shown in 1 to 7 in FIG. **3**.


1 2 3 4 5
6 7 8 9 0

Stencil prints of numbers, story illustrations, flowers, etc. are shown in **Plate 26.** By following the instructions given in the previous lesson, you can make stencils for the alphabets of any language. Sometimes a single piece of stencil will be found convenient for a whole word, instead of matching together small stencils of separate letters. In that case, take a long strip of cardboard, write the required word on it and cut out the unnecessary portions.

The ink or paint used for stencilling should be of suitable thickness. If it is too thin, it will spread underneath the stencil and spoil the outline. Take plenty of paint on a brush and apply it through the stencil from the outline inwards. Keep the stencil well pressed to the paper below. When a large number of prints are to be made, or when a number of boys and girls in a class have to take copies of the same designs, stencils are very useful. The ink or dye used for stencilling on cloth or canvas should be non-washable, like marking-ink.

Plate 27 NEEDLEWORK BOX

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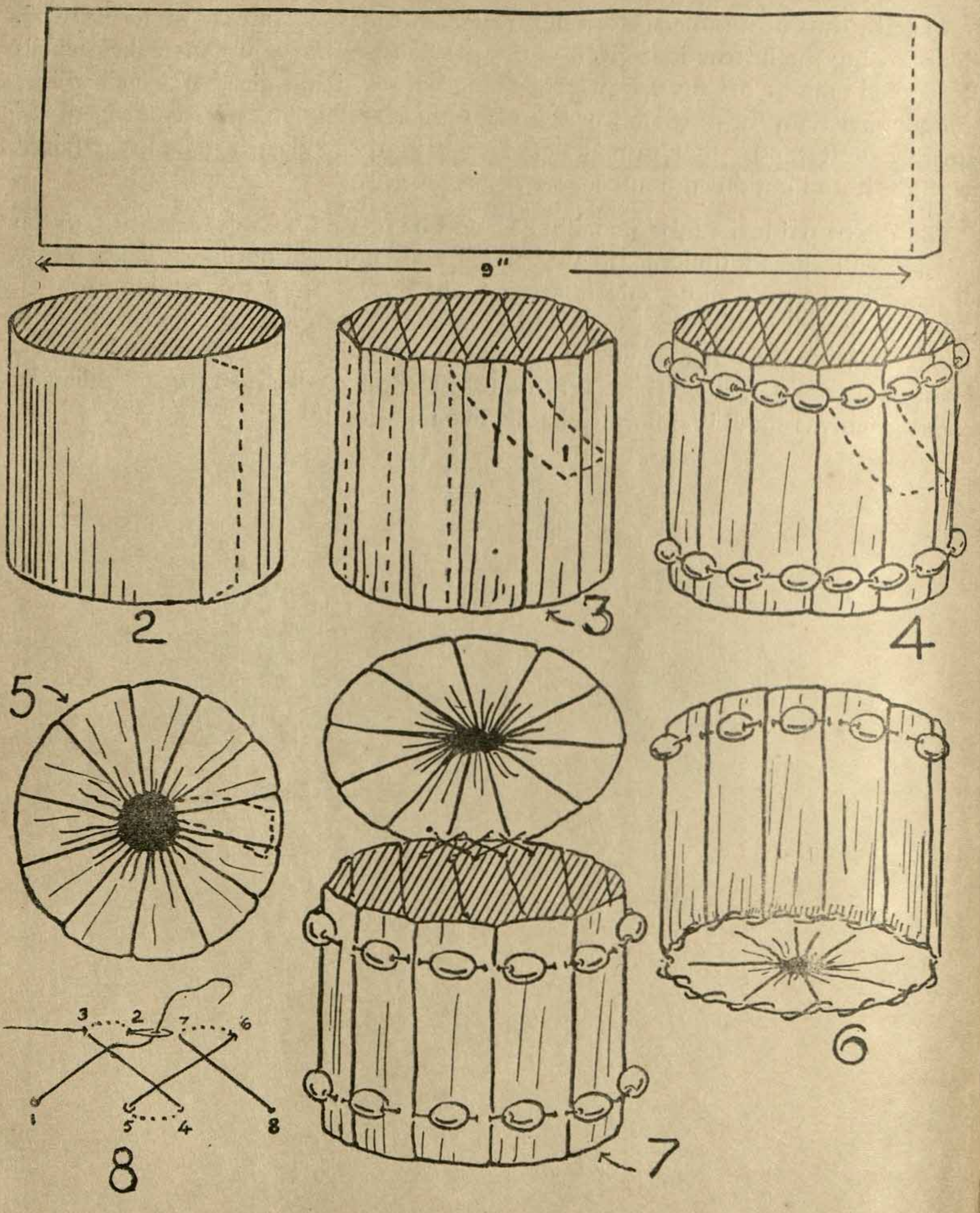
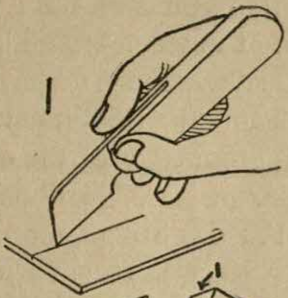


NEEDLEWORK BOX

Plate 27

Take a piece of cardboard about 9 inches long with a flap at one end as in Fig. **1**. Make it into a cylinder as in Fig. **2**. Take some ribbon of any colour and hold one of its ends over the cylinder from inside, as 1 in Fig. **3**, and wind the ribbon over the cylinder as shown in Fig. **3**. The dotted line is one edge of the ribbon covered by the following layer. Stitch the end of the ribbon to the bottom edge of the cylinder. Stitch beads round the box as in Fig. **4**. Take two circular pieces of cardboard with holes in the centre and cover them with ribbon as in Fig. **5**. Stitch one of these at the bottom covering it fully as in Fig. **6**. The other piece is stitched over the top as a lid as in Fig. **7**. The manner of stitching is shown in Fig. **8**. The numbers in Fig. **8** indicate the order in which the threading is done connecting the lid to the edge of the cylinder.

CARD-BOARD MODELS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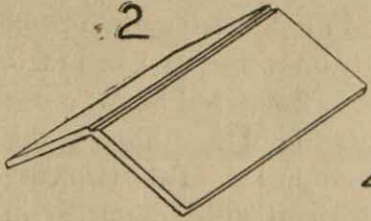
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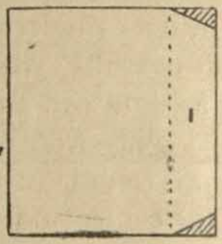
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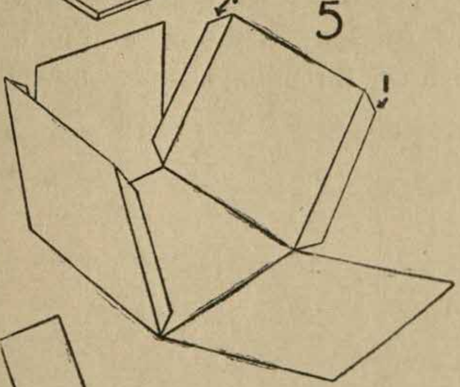
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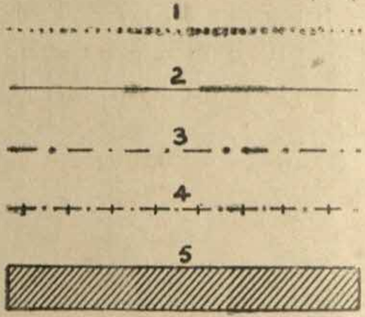
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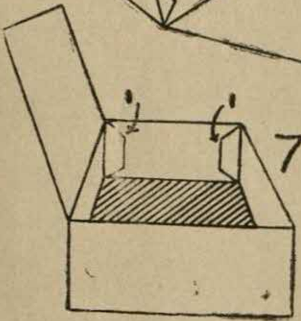
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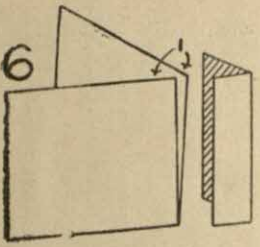
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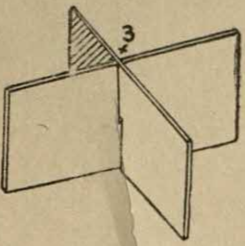
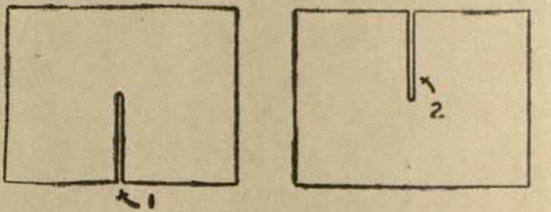




8

CARD-BOARD MODELS

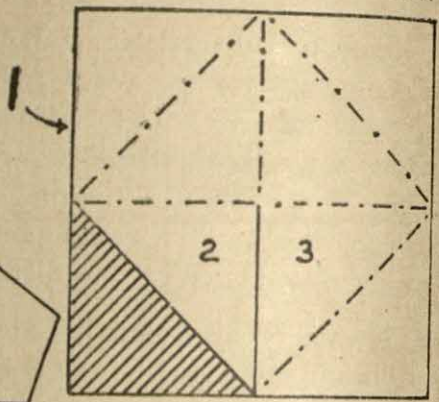
Many useful models may be made of cardboard. Cardboard is largely used in packing and we see a variety of shapes and sizes of cardboard boxes in our daily life. There are boxes for pins, tooth-pastes, bottles and there are pin-trays, clip boxes, soap boxes, letter-racks and pen and ink stands. Simple toys can also be made of cardboard. Simple models of houses and cottages can be made in cardboard. In fact, the scope for its use is unlimited. Medicinal powders, toilet powders, and even certain dietary preparations are packed in cardboard containers.

Plywood is also used for almost all purposes for which cardboard is used, but cardboard work can be done with the help of a few implements like a sharp knife, a pair of scissors, as also a foot-rule, whereas instruments like drills, saw, hammer, as well as nails etc., are required for work in plywood.

For cardboard modelling, you require a sharp knife and a pair of scissors as stated above. As cardboard can be folded and stuck, there is no need for nails. But you must avoid folding the cardboard upward and downward more than once, as the board will give way. Sometimes the same piece is used for different faces and so the cardboard may have to be folded upward or downward. If the board is thick, it is necessary to make a slight incision on one side as in Fig. **1** and then it can be easily folded downward as in Fig. **2**, with the edges neatly formed. If the board is thin, no incision need be made. If the point of a hard pencil is drawn with some pressure along the line of the fold, it will be easy to fold the board. In Fig. **3**. some directions are given and they are followed throughout the following lessons on cardboard modelling. In Fig. **3**, 1 shows the construction line of the model, 2 shows a complete cut, 3 shows folding in one direction, 4 shows folding in the opposite direction and 5 shows the portion to be cut off altogether. When two edges are to be joined together, an extra space is provided as a 'flap' as 1 in Fig. **4** and corners of this flap are cut off a little, as 1 in Figs. **5** & **7**. When there are no such flaps left, as 1 in Fig. **6**, a separate binding piece is stuck at the edges as 2 in Fig. **6**. Compartments are made by cutting slits as 1-2 in Fig. **8** and the two pieces are inserted into one another as 3 in Fig. **8**.

There are different varieties of cardboard. There are straw-boards which are brown in colour and of varying thicknesses. These are more brittle than the box-boards and they should be handled carefully while folding. There are box-boards of different colours. Some varieties are coloured on one side and grey on the other side. Some are coloured on both sides. If you use brown straw-boards you may have to use colour strips for sticking the corners so that the model may look nice. If you use colour box-boards, the models do not require any colour strips for the corners.

CARD-BOARD MODELS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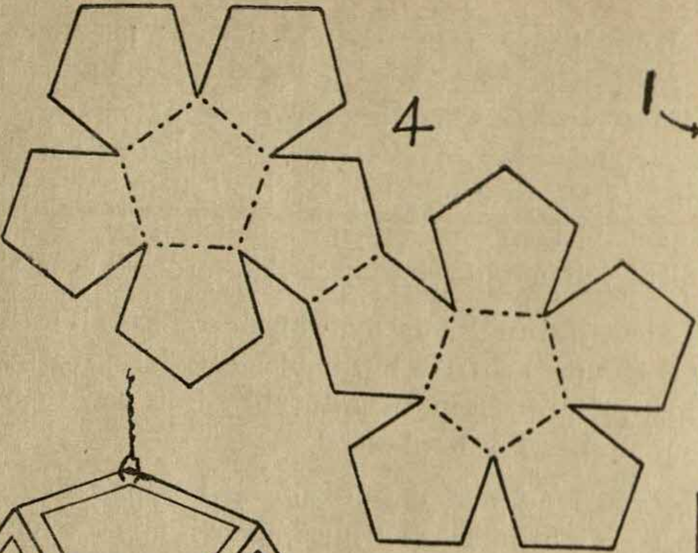
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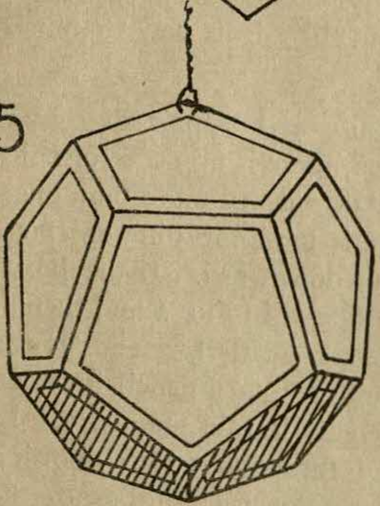
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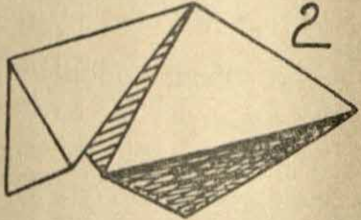
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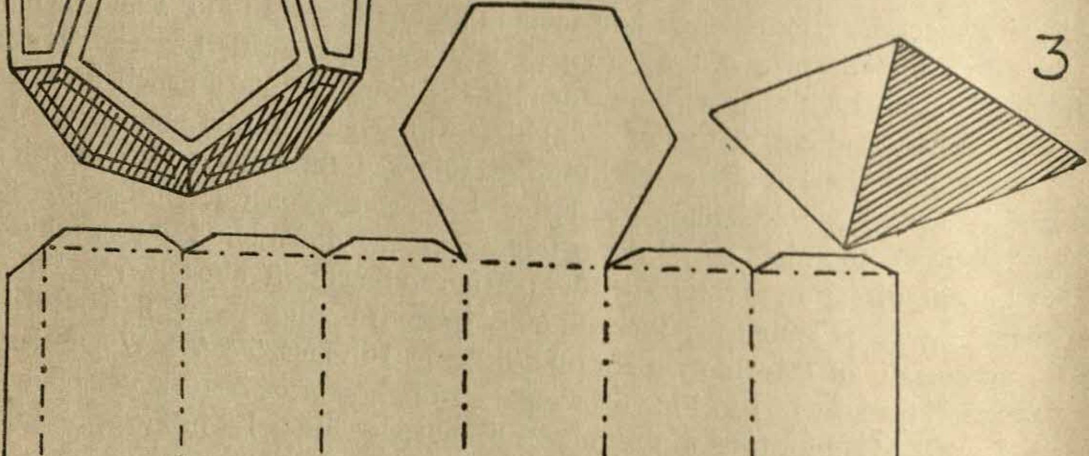
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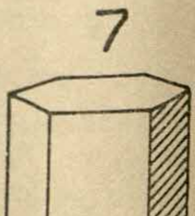
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It is interesting to learn how to make geometrical models. When all the surfaces of a model are spread out we call it the "development" of the model. It requires accurate measurement to make a perfect model. These models help us to understand solid geometry better. A few models are explained here.

TRIANGULAR PYRAMID

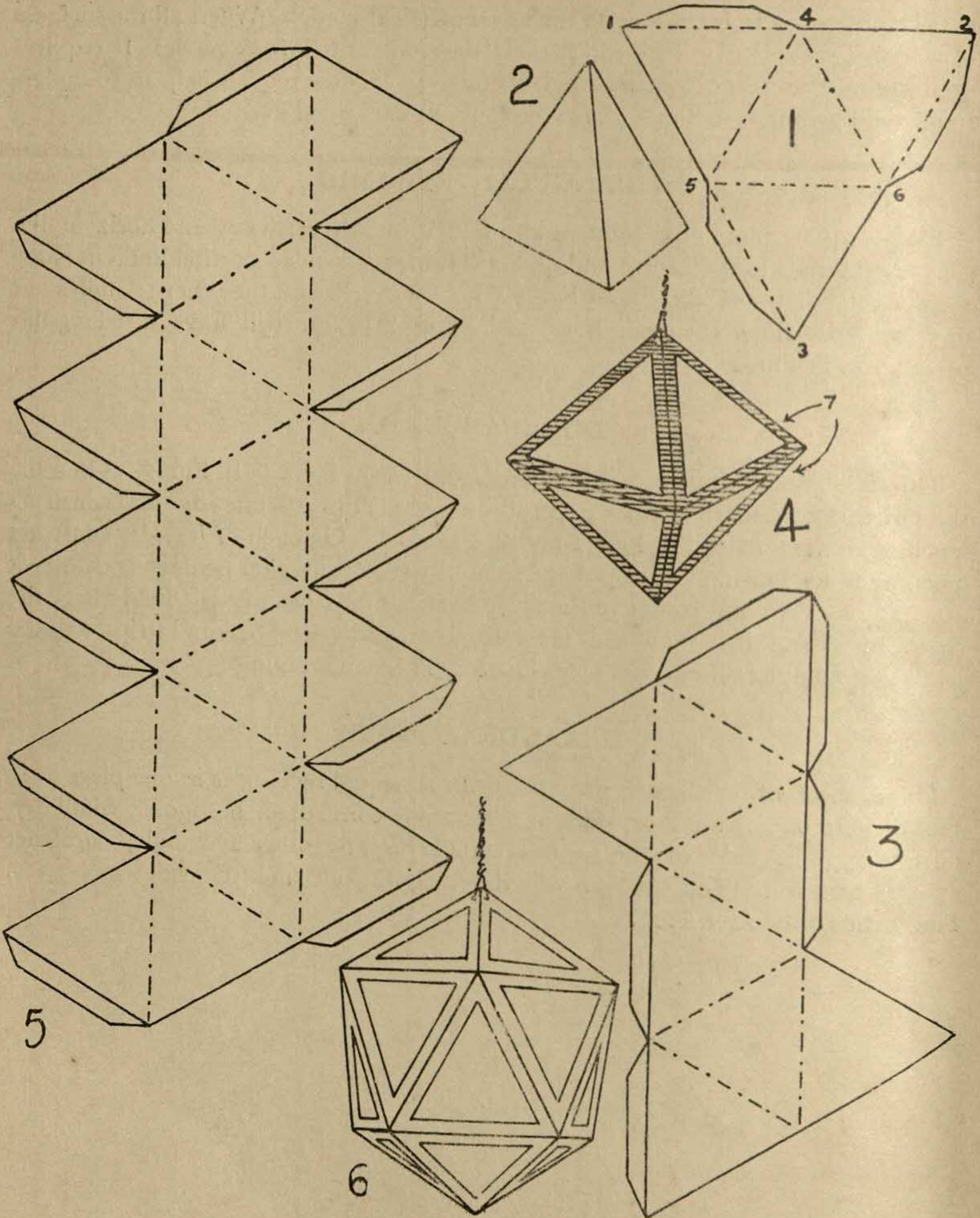
Take a square piece of cardboard and fold it in half vertically and horizontally. Fold the corners to the centre and open. Cut off the shaded portion and cut along the dark line between 2 and 3 in FIG. **1**. Fold 2 over 3 and the other triangles one over the other along the chain lines, as in FIG. **2**. You will have a triangular pyramid as in FIG. **3**.

DODECAHEDRON

This is a model of twelve equal pentagons for its faces as in FIG. **4**. On a big sheet of thin cardboard or thick paper, draw a circle towards one edge and construct a pentagon as explained in FIGS. **1** and **2**, **Plate 14**. On each of its sides construct a pentagon as shown. On one of the sides of one of the outer pentagons construct a pentagon again and complete the second series of six pentagons. Fold along the chain lines and bring all the faces together and paste narrow strips on the joints and complete the model as in FIG. **5**. This can be hung up.

HEXAGONAL PRISM

On a sheet of cardboard or paper draw six equal rectangles in one piece as in FIG. **6**. On one of the short sides of a rectangle construct a hexagon. Similarly, on the opposite side of the same rectangle or any other rectangle, construct another hexagon. You may provide flaps. Fold and stick the sides and ends. Finish the model as in FIG. **7**.



TETRAHEDRON

This model has four faces which are equilateral triangles of equal size as in Fig. 1. Draw a big equilateral triangle 1-2-3, as in Fig. 1 on a piece of cardboard and join 4-5-6 the midpoints of the sides. You get four equilateral triangles. Allow flaps for sticking as shown. Cut out the whole piece and fold along the chain lines and stick the sides. Let the flaps go inside, as in Fig. 2.

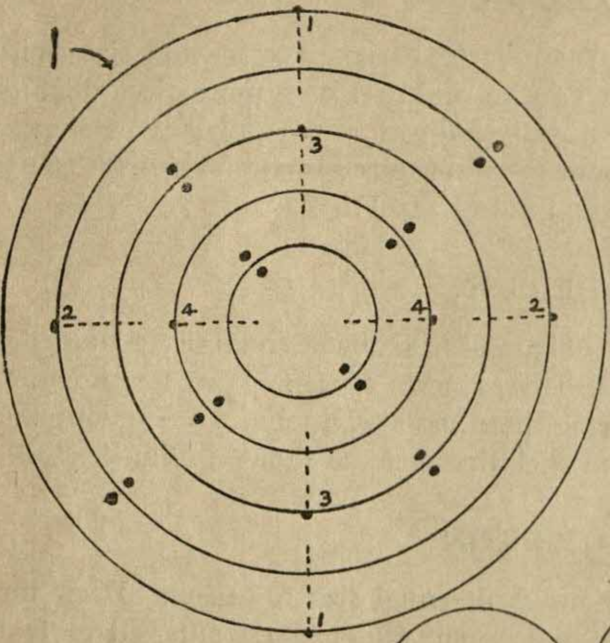
OCTAHEDRON

This model has eight faces which are equilateral triangles of equal size. Draw the figure shown in Fig. 3. You may provide flaps as in Fig 1. If flaps are not provided for sticking, use separate strips for binding the edges as 7 in Fig. 4. Cut out the piece and fold along the chain lines and stick the model as shown in Fig. 4.

ICOSAHEDRON

This model has twenty equilateral triangles of equal size for faces. Draw the figure shown in Fig 5 on a big sheet of paper, cut out along the outer edges, fold along the chain lines and stick as you did in the other models, as in Fig. 6. All these models can be used for decorative purposes also by hanging them up by strings.

CARD-BOARD MODELS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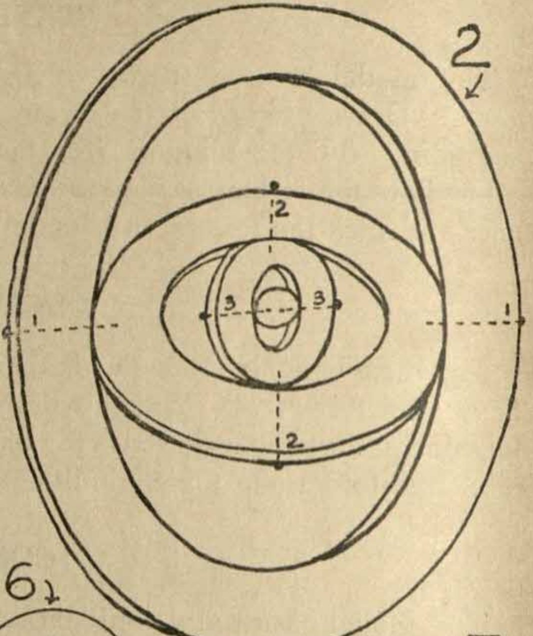
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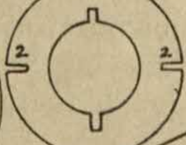
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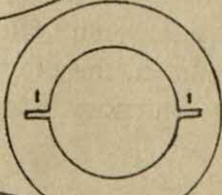
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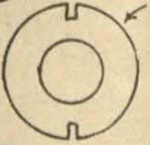
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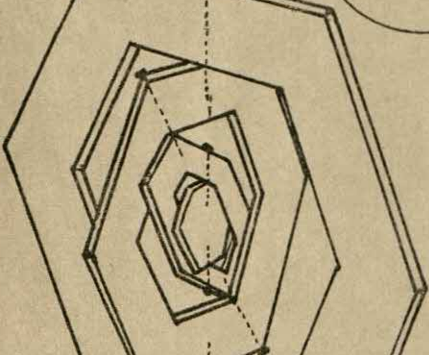
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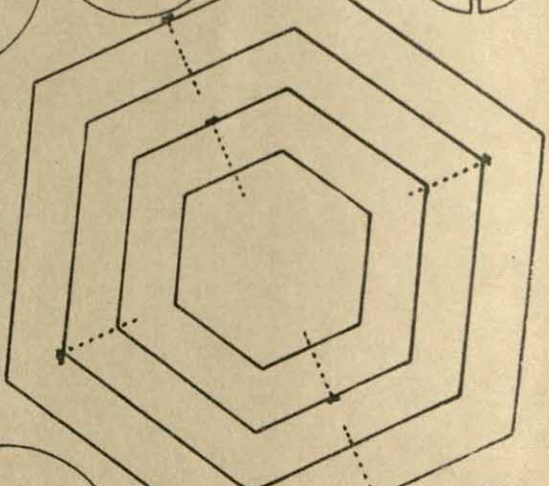
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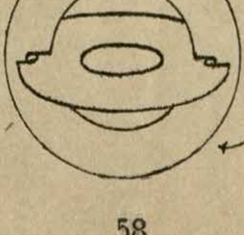
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THE PLANETARY PLANES

Draw on a thick cardboard as many concentric circles as you want at equal intervals, beginning with the biggest with a diameter of about 10″ as in Fig. **1**. Cut out the rings carefully. For fixing one ring within another mark point as 1-1 in the outermost ring, 2-2 in the second ring, 3-3 in the third ring and 4-4 in the fourth ring. Note that points 1-1 and 3-3 are at right angles to 2-2 and 4-4. Note that each pair of points is on the same diameter. Fig. **2** shows a model of four rings. Fix the rings by means of pins driven into the cardboard. Figs. **3** and **4** show the same principle applied to hexagonal shapes. They can be tied to each other by a piece of twine at the places marked by dots in the figure. There is also another method which is explained below. In Fig. **1**, the circles are concentric and are drawn on the same cardboard. The inner circumference of the first ring and the outer circumference of the second one are the same. But in the new method if the circumference of the first ring is 21″, let the outer circumference of the second be greater than 21″, but the second ring should be smaller in size than the first. Make slits 1-1 in the first ring on the inner edge as in Fig. **5** and slits 2-2 in the second on the outer edge as in Fig. **6**. Fix the ring in Fig. **6** into the first one in Fig. **5** as shown in Fig. **8**. The ring, Fig. **7**, can be fixed into the ring, Fig. **6**, in the same manner. Models such as these require thinking and calculation and many new models can be planned and made.

Plate 32

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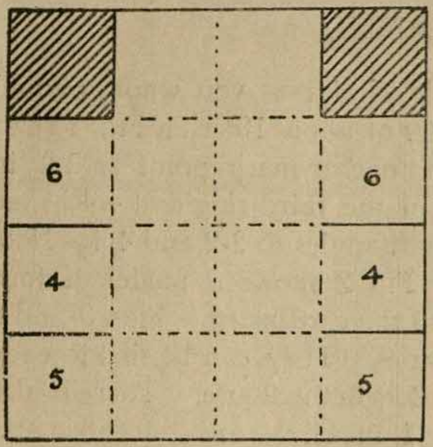

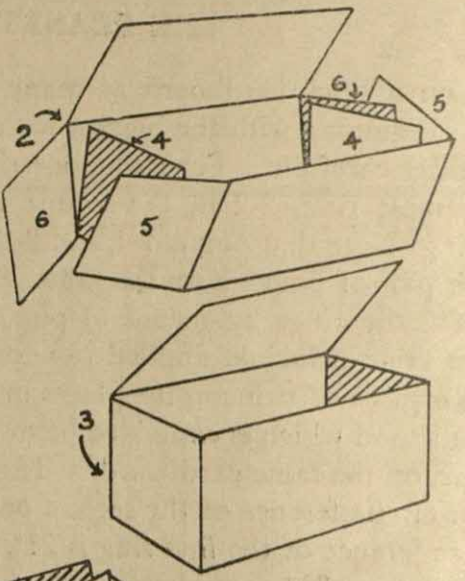

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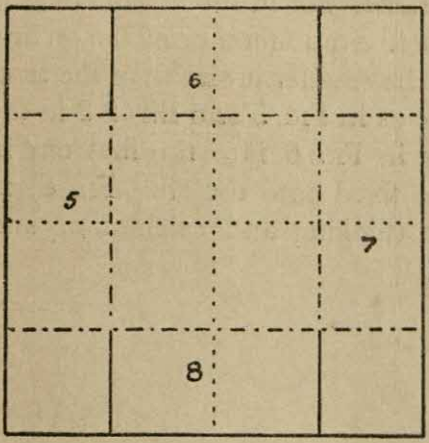

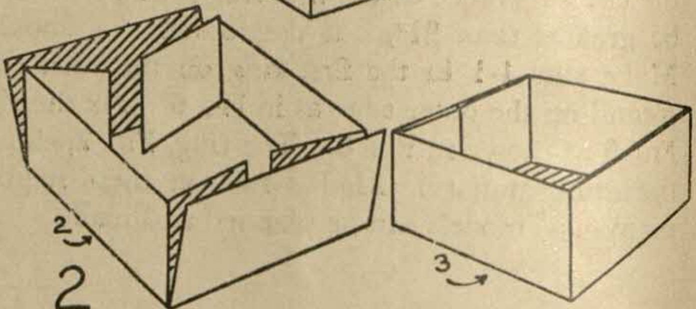

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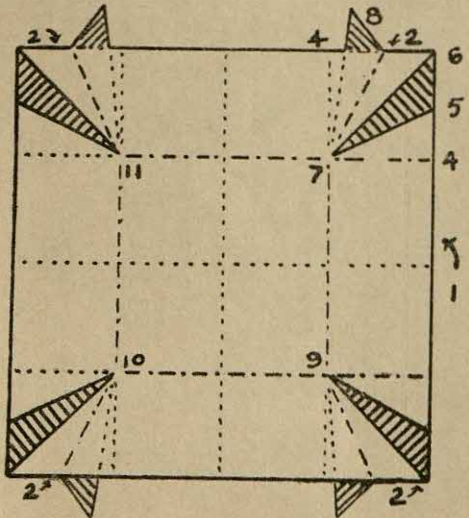
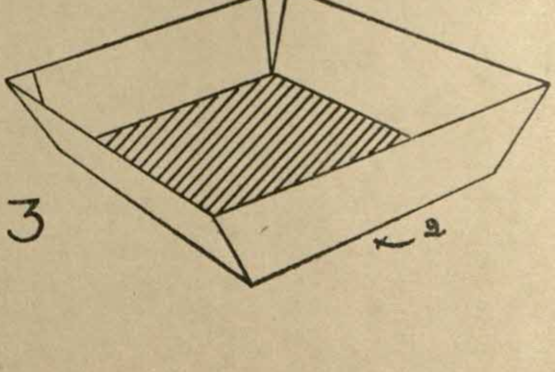




3

A RECTANGULAR BOX

Take a square piece of cardboard and divide it into sixteen equal squares by dividing it into halves and quarters vertically and horizontally as 1 in Fig. **1**. Cut off the shaded squares. Fold 4 and 4 upwards and cover with 5 and 6 at both ends and stick, as 2 in Fig. **1**. The box in 3, Fig. **1** is thus made.

A SQUARE TRAY

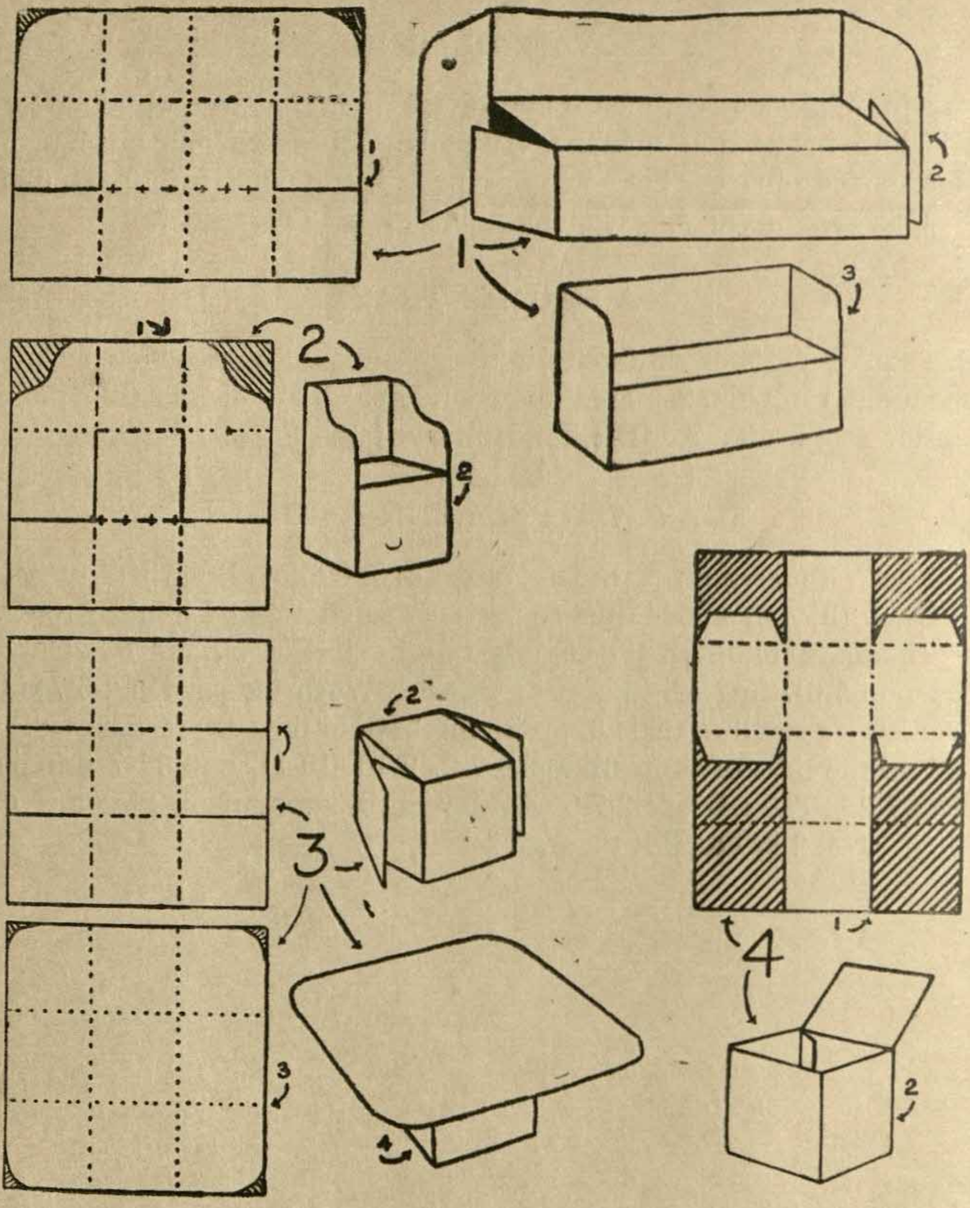
Divide a square piece of cardboard into sixteen squares as before. Cut along the dark lines as 1 in Fig. **2**. Fold up the sides 5, 6, 7, 8, and fold the corner squares inside as 2 in Fig. **2**. The finished tray is 3 in Fig. **2**.

TRAY WITH SLANTING SIDES

Draw sixteen squares on a square piece of cardboard, as before, as 1 in Fig. **3**. Draw the diagonals in the four corner squares and cut along them. In each corner square fold both the cut edges to the sides as 4-7 and 7-4. Cut off the shaded portion 5-6-7 in each square as shown. When the portion 2-6-7 is folded to 4-7, you have a small triangle 8, projecting beyond the edge of the card. Cut it off. Fold up the sides of the card along 7-9, 9-10, 10-11, and 11-7 bringing the edge 5-7 to 7-2. The triangle 2-7-6 will serve as a flap marked 2 in other corners for sticking. No. 2 in Fig. **3** is the tray.

Plate 33

CARD-BOARD MODELS



SOFA

Take a piece of cardboard and draw on it twelve squares (4 × 3) as 1 in Fig. **1.** Cut along the dark line and round off the top corners. Fold as shown in 2 in Fig. **1.** Stick as shown in 3 in Fig. **1.**

CHAIR

The chair has only nine squares as 1 in Fig. **2.** In making this set of sofa, chair and table see that the squares are of the same size in all the articles. Fold the parts as you did for the sofa. The chair is made as 2 in Fig. **2.**

TABLE

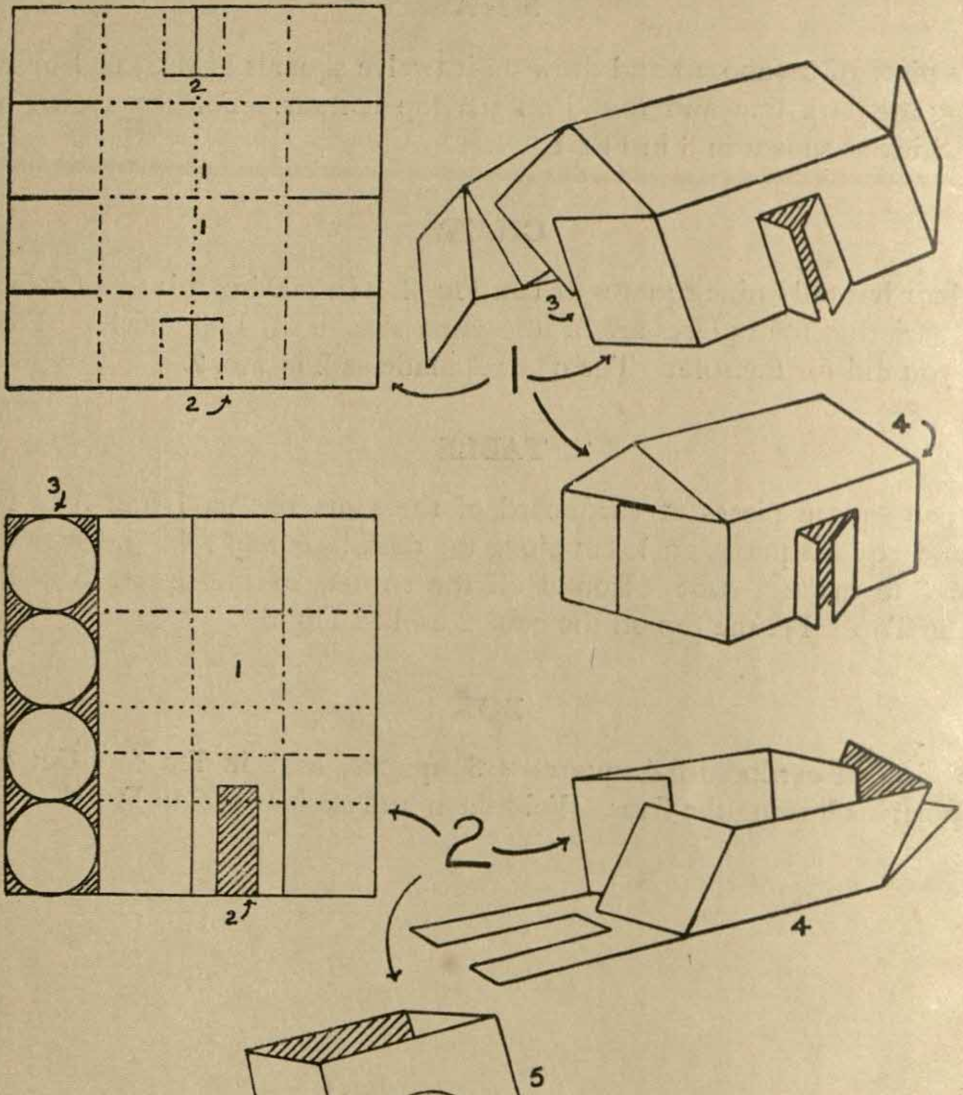
Take two square pieces of cardboard of the same size as 1 and 3 in Fig. **3.** Mark nine equal squares on 1, cut along the dark lines and fold and stick it as in 2, in Fig. **3** to make a cube. Round off the corners of the square 3 in Fig. **3.** This is the Top. Fix the top on the cube 2 as 4 in Fig. **3.**

BOX

Cut a piece of cardboard, 4 squares × 3 squares, as 1 in Fig **4.** Cut off the shaded portions leaving the flaps. Fold them and stick as in 2 in Fig. **4.**

Plate 34

CARD-BOARD MODELS



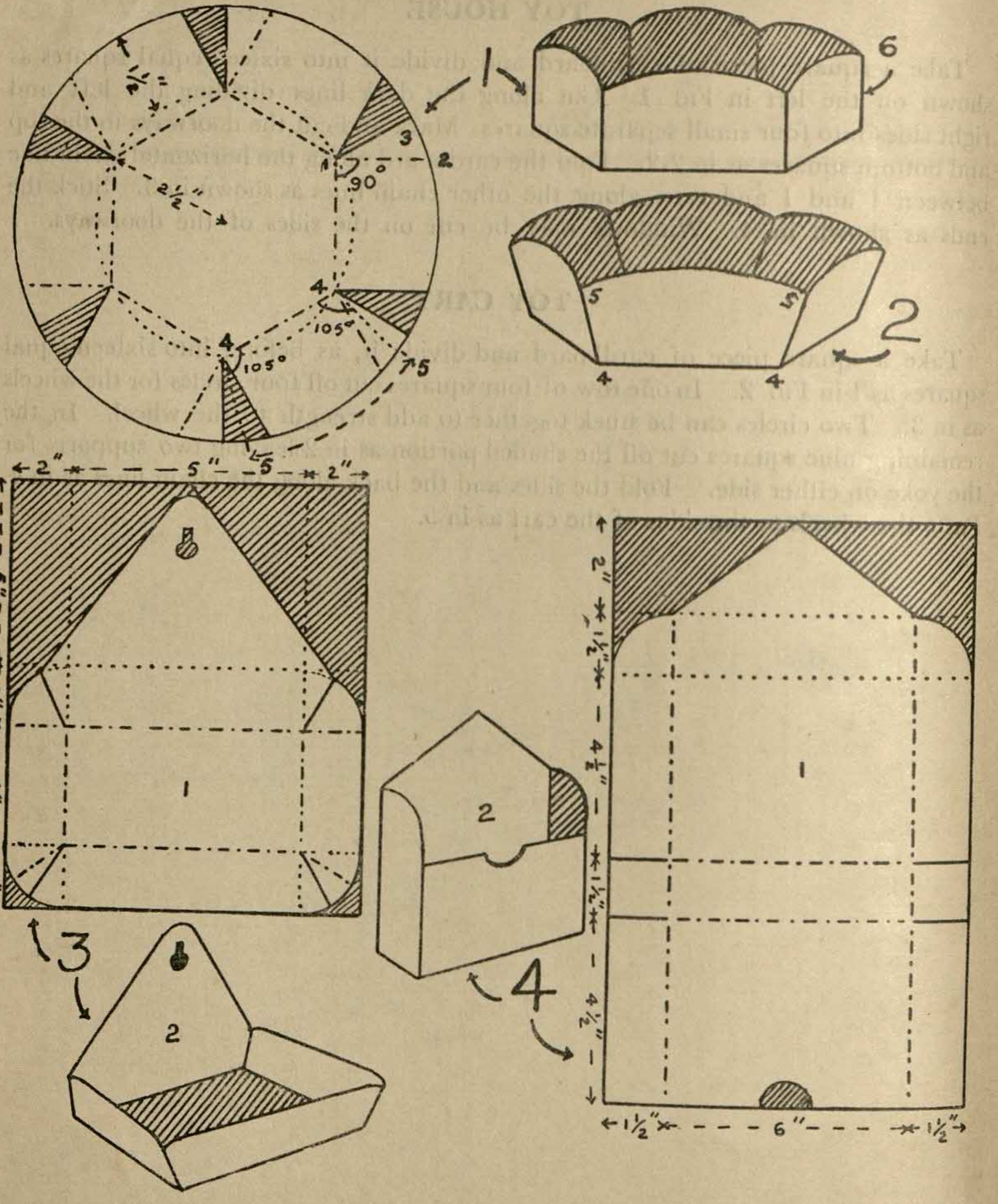
TOY HOUSE

Take a square piece of cardboard and divide it into sixteen equal squares as shown on the left in FIG. **1**. Cut along the dark lines dividing the left and right sides into four small separate squares. Mark and cut the doorways in the top and bottom squares as in 2-2. Fold the cardboard along the horizontal chain line between 1 and 1 and then along the other chain lines as shown in 3. Stick the ends as shown in 4. Windows may be cut on the sides of the doorways.

TOY CART

Take a square piece of cardboard and divide it, as before, into sixteen equal squares as 1 in FIG. **2**. In one row of four squares cut off four circles for the wheels as in 3. Two circles can be stuck together to add strength to the wheel. In the remaining nine squares cut off the shaded portion as in 2 leaving two supports for the yoke on either side. Fold the sides and the back along the chain lines as in 4. Paste the wheels to the sides of the cart as in 5.

CARD-BOARD MODELS



HEXAGONAL TRAY—VERTICAL SIDES

Cut out a circle of 4″ radius from a piece of cardboard. Describe on it a smaller circle of 2½″ radius with the same centre. Mark off the radius of the smaller circle on its circumference and join the points. A hexagon is formed in the inner circle as in FIG. **1**. Draw perpendiculars to the sides of the hexagon to reach the outer circle like 1-2. 1-3 is part of the radius of the bigger circle. The portion 1-2-3 serves as a flap when the sides of the tray are folded. Cut off the shaded portions. Fold the sides of the tray along the chain lines and finish the model by sticking the flaps inside as in 6.

HEXAGONAL TRAY—SLANTING SIDES

Cut out a circle from a piece of cardboard and prepare the shape in the same manner as for the tray with vertical sides shown in FIG. **1**. Instead of drawing perpendiculars like 1-2, draw 4-5 at an obtuse angle to the side of the hexagon 4-4. An angle of 105° is shown in the figure. Draw the same angle at the ends of all the sides of the hexagon.

The edge of each side of the tray is covered by the arc 5-5 of FIG. **1**. When the sides are folded along 4-4, the tray will have slanting sides like 4-4-5-5 as in FIG. **2**.

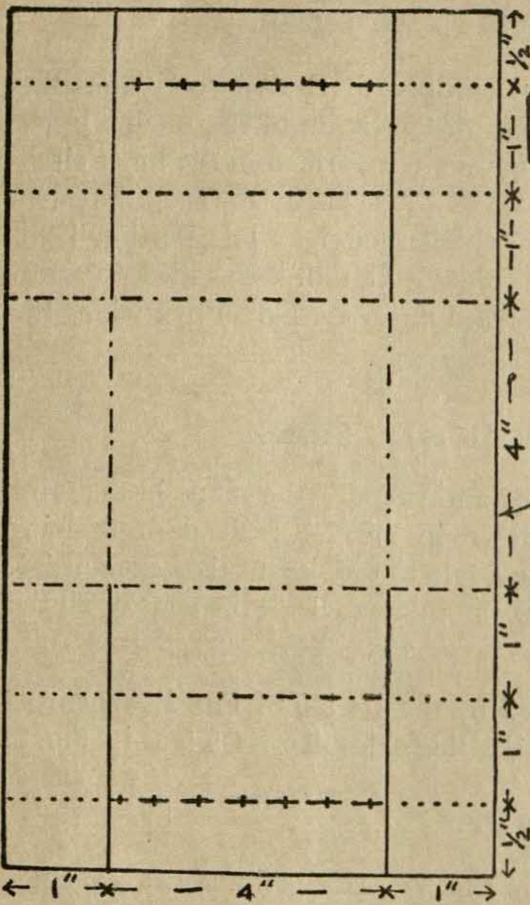
WALL TRAY

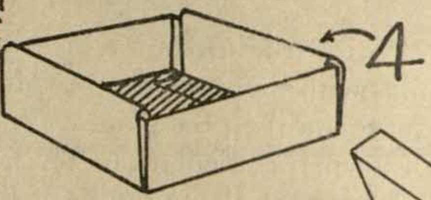
Take a piece of cardboard 13″×9″ as 1 in FIG. **3**. Mark off and draw vertical lines 2″-5″-2″ apart and horizontal lines 5″-2″-4″-2″ apart. Draw the shape as shown in the figure and cut off the shaded portions. Fold along the chain lines and stick the sides and the back to the shape shown in 2, FIG. **3**. Make a hole at the top of the back of the tray for hanging it on the wall.

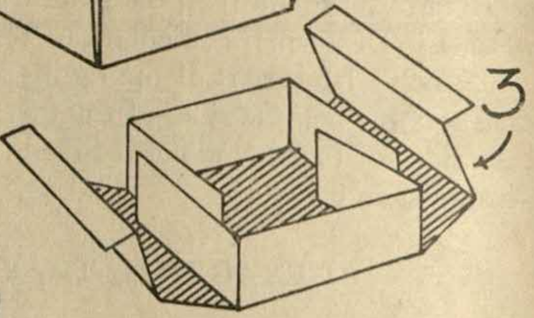
LETTER RACK

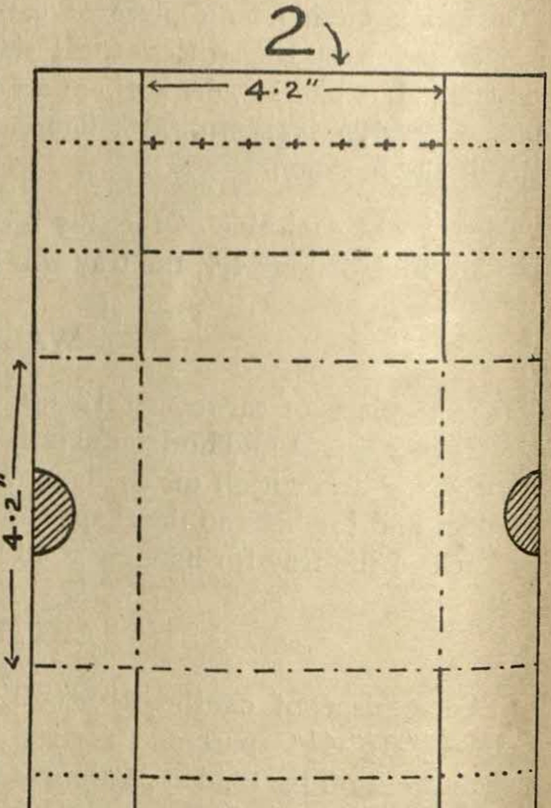
Take a piece of cardboard 14″×9″. Draw on it from the top horizontal lines 2″-1½″-4½″-1½″-4½″ apart and vertical lines 1½″-6″-1½″ apart. Cut along the dark lines and cut off the shaded portions as shown in 1, FIG. **4**. Fold along the chain lines to the shape shown in 2, FIG. **4** and stick the front and back of the rack to the sides. If a hole like the one shown at the top in 1 of FIG. **3** is made in the back of the rack, it can be hung up on the wall.

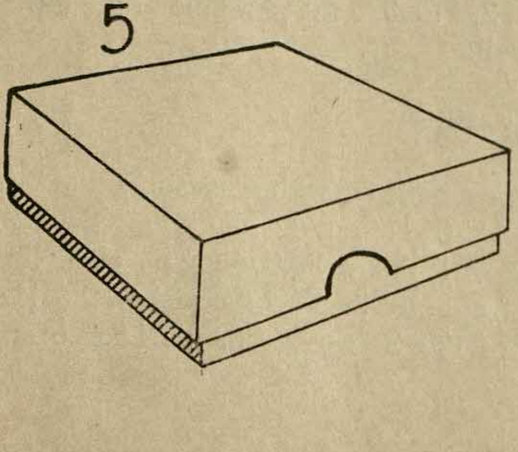
CARD-BOARD MODELS











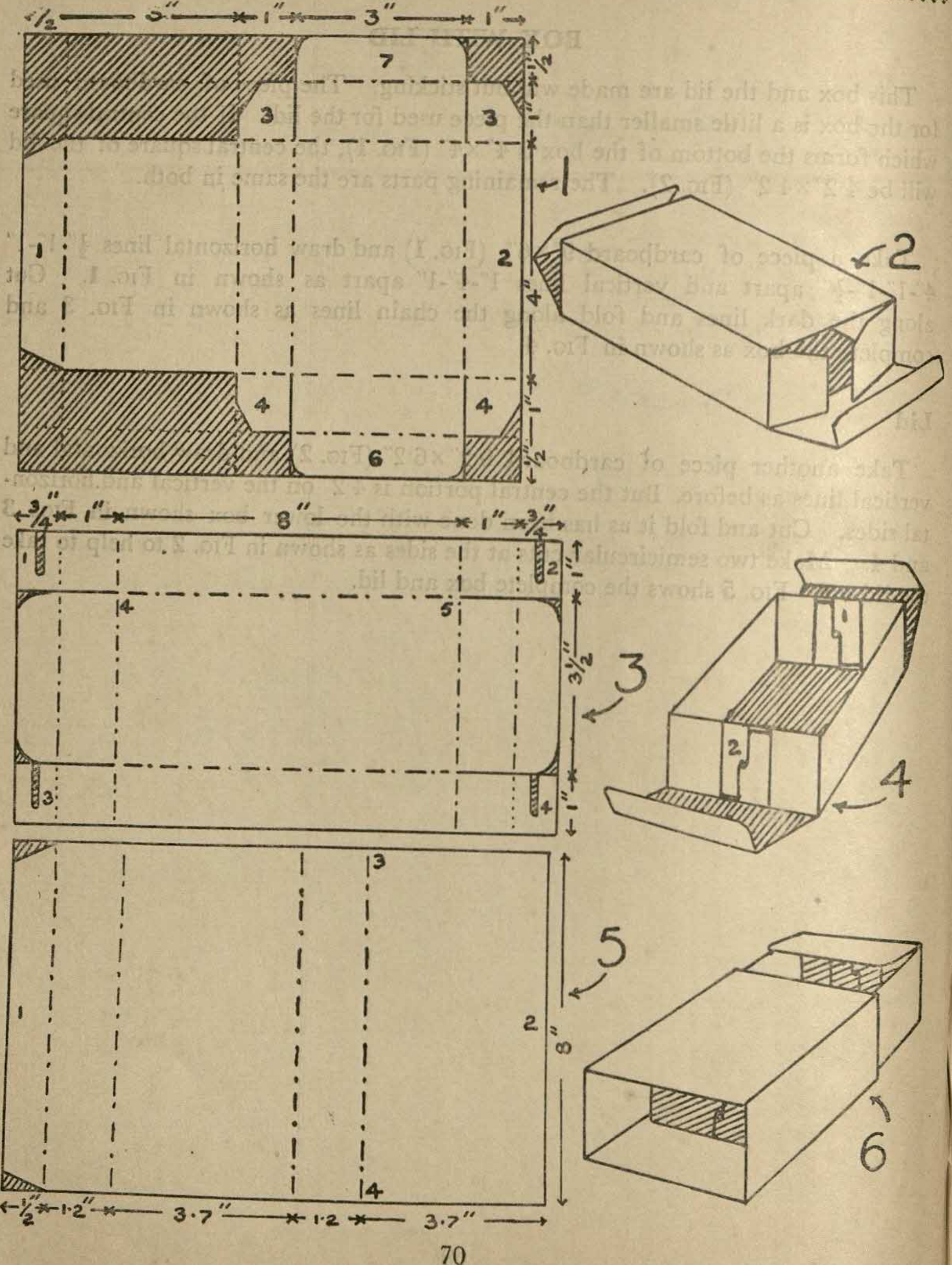
BOX WITH LID

This box and the lid are made without sticking. The piece of cardboard used for the box is a little smaller than the piece used for the lid. If the central square which forms the bottom of the box is 4″×4″ (FIG. **1**), the central square of the lid will be 4·2″×4·2″ (FIG. **2**). The remaining parts are the same in both.

Take a piece of cardboard 9″×6″, (FIG. **1**) and draw horizontal lines ½″-1″-1″ 4″-1″-1″-½″ apart and vertical lines 1″-4″-1″ apart as shown in FIG. **1**. Cut along the dark lines and fold along the chain lines as shown in FIG. **3** and complete the box as shown in FIG. **4**.

Lid

Take another piece of cardboard 9·2″×6·2″ (FIG. **2**) and draw horizontal and vertical lines as before. But the central portion is 4·2″ on the vertical and horizontal sides. Cut and fold it as has been done with the lower box shown in FIGS. **3** and **4**. Make two semicircular cuts at the sides as shown in FIG. **2** to help to take the lid off. FIG. **5** shows the complete box and lid.


1/2
3"
1"
3"
1"
7
3
3
1
2
4
4
6
1/2
1"
4"
1"
1/2
3/4"
1"
8"
1"
3/4"
1
2
4
5
3
4
1"
3½"
1"
3
1
2
4
8"
1/2"
1·2"
3·7"
1·2
3·7"
1
2
3
4
5
6

SOAP BOX

Take a piece of cardboard $8\frac{1}{2}'' \times 7''$. Draw horizontal lines $\frac{1}{2}''$-$1''$-$4''$-$1''$-$\frac{1}{2}''$ apart and vertical lines $\frac{1}{2}''$-$3''$-$1''$-$3''$-$1''$ apart as in Fig. **1**. Mark the shaded portions carefully and cut them off. Cut along the dark lines and fold along the chain lines. Stick the flap 1 inside 2. Fold flaps 3, 3 and 4, 4 inwards. Flaps 6 and 7 are to be inserted into the box at both ends as in Fig. **2**.

PENCIL BOX

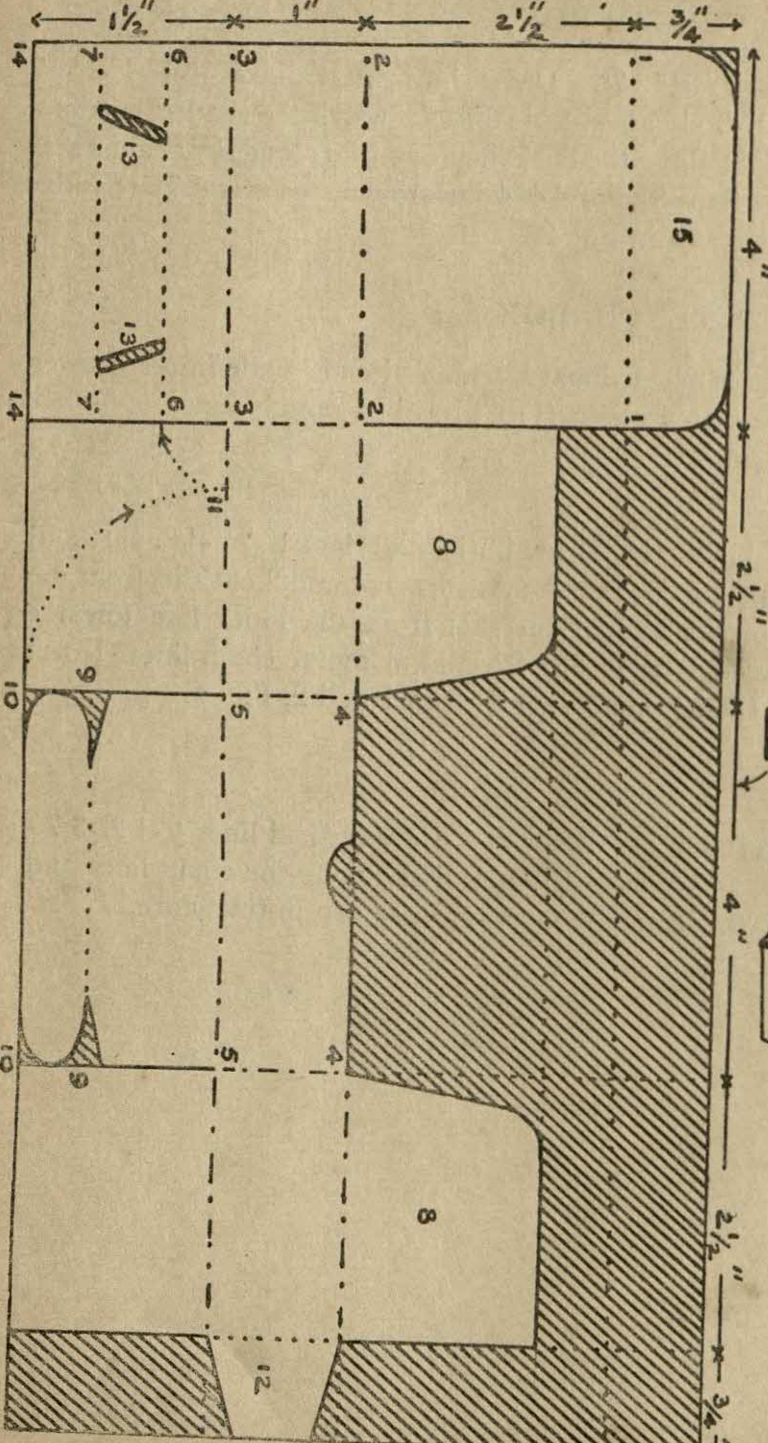
This model requires two pieces of cardboard. One piece is made into a drawer (Fig. **4**) and the other is made into a cover (Fig. **6**) as in a match box.

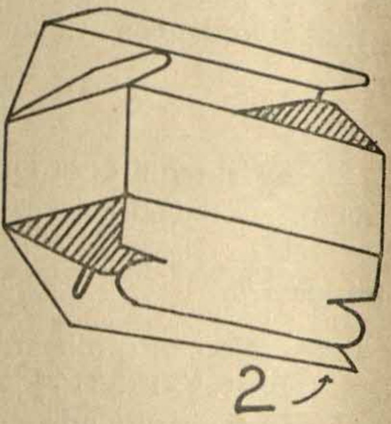
Drawer

Take a piece of cardboard $11\frac{1}{2}'' \times 5\frac{1}{2}''$. Draw horizontal lines $1''$-$3\frac{1}{2}''$-$1''$ apart and vertical lines $\frac{3}{4}''$-$1''$-$8''$-$1''$-$\frac{3}{4}''$ apart as in Fig. **3**. At corners 1 and 2 cut slits from the outer edge inwards and at corners 3 and 4 cut slits from the inner line towards the edge but not reaching the edge, as in Fig. **3**. Fold along the chain lines. Insert corner 1 into corner 3 and corner 2 into corner 4 as in 1 and 2, Fig. **4**.

Cover

Take another piece of cardboard $10{\cdot}3'' \times 8''$ and draw vertical lines $\frac{1}{2}''$-$1{\cdot}2''$-$3{\cdot}7''$-$1{\cdot}2''$-$3{\cdot}7''$ apart (Fig. **5**). Cut the corners of flap 1. Fold along the chain lines and stick flap 1 inside 2 as in Fig. **6**. Insert the drawer as shown in the figure.


1½"
1"
2½"
¾"
4"
2½"
4"
2½"
¾"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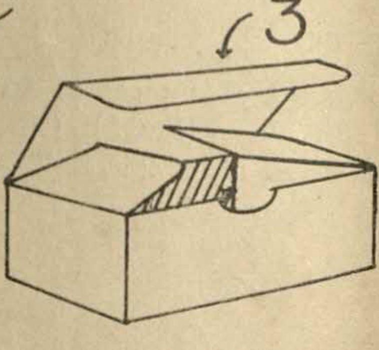
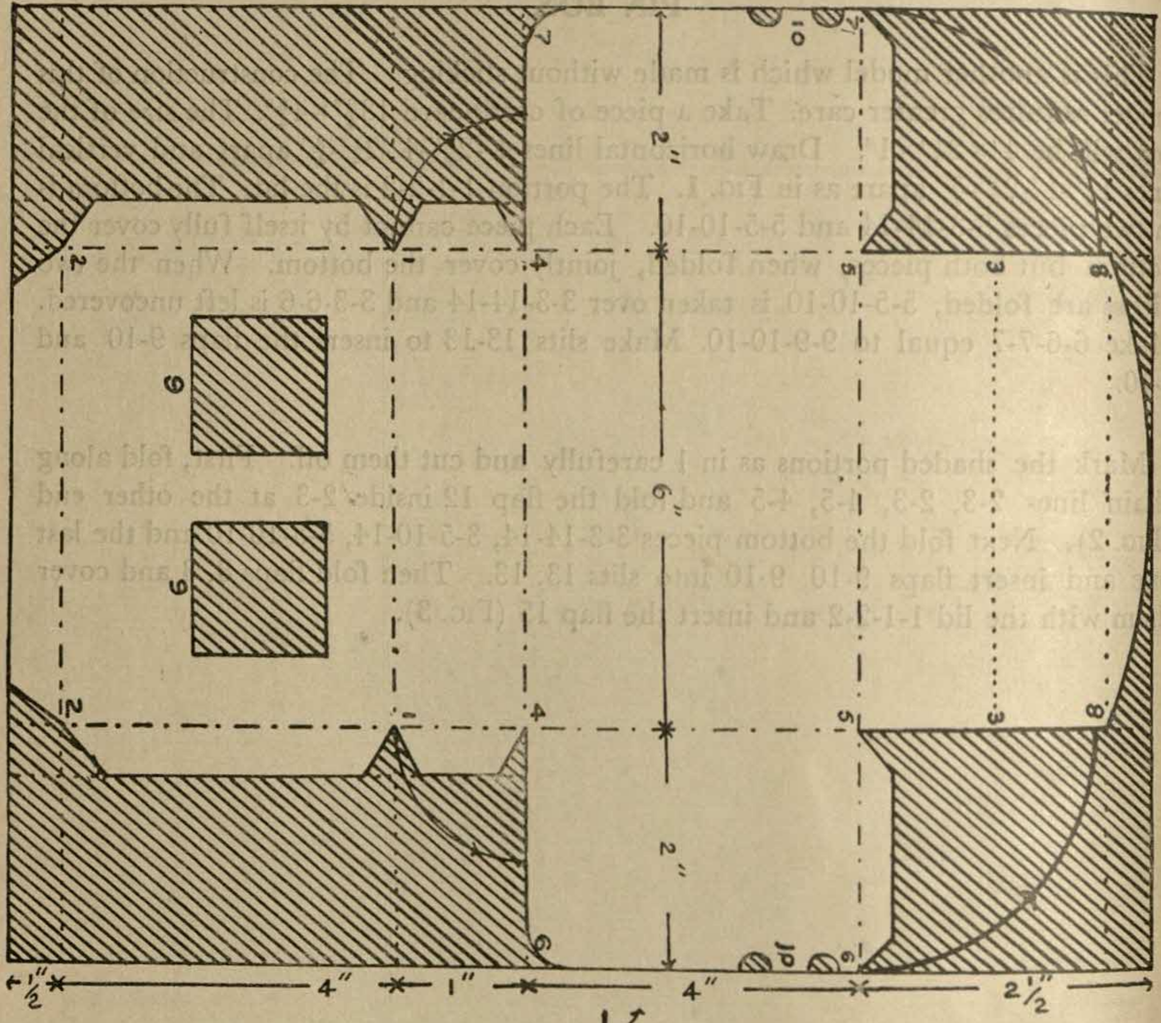

3

PIN BOX

This is another model which is made without sticking. The construction of this model requires greater care. Take a piece of cardboard 13¾"×4¾". The size of the box will be 4"×2½"×1". Draw horizontal lines 4"-2½"-4"-2½"-¾" apart and vertical lines 1½"-1"-2½"-¾" apart as in Fig. **1**. The portion 1-1-2-2 is the lid. The bottom is in two pieces 3-3-14-14 and 5-5-10-10. Each piece cannot by itself fully cover the bottom but both pieces, when folded, jointly cover the bottom. When the two pieces are folded, 5-5-10-10 is taken over 3-3-14-14 and 3-3-6-6 is left uncovered. Make 6-6-7-7 equal to 9-9-10-10. Make slits 13-13 to insert the flaps 9-10 and 9-10.

Mark the shaded portions as in 1 carefully and cut them off. First, fold along chain lines 2-3, 2-3, 4-5, 4-5 and fold the flap 12 inside 2-3 at the other end (Fig. **2**). Next fold the bottom pieces 3-3-14-14, 3-5-10-14, 5-5-10-10 and the last one and insert flaps 9-10, 9-10 into slits 13, 13. Then fold flaps 8, 8 and cover them with the lid 1-1-2-2 and insert the flap 15 (Fig. **3**).



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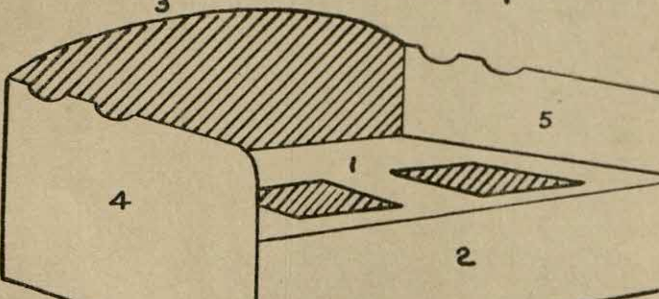


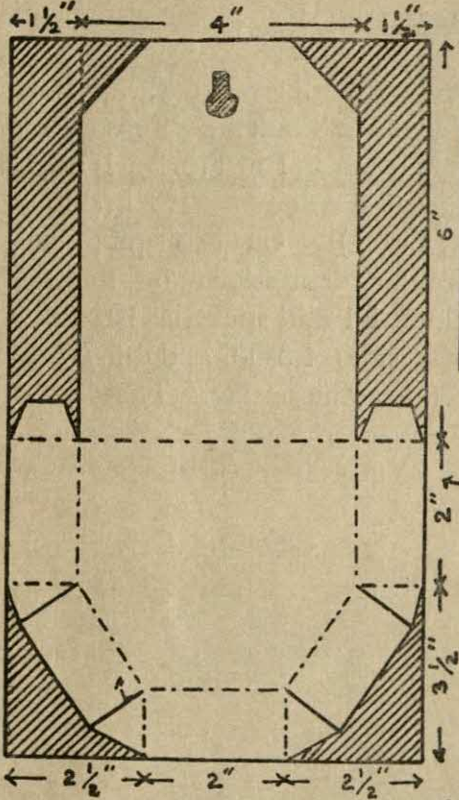
2

PEN AND INK STAND

Take a piece of cardboard 12″×10″ and draw horizontal lines 2″-6″-2″ apart and vertical lines ½″-4″-1″-4″-2½″ apart as in FIG. **1**. Mark the shaded portions and cut them off. The portion 1-1-2-2 is the top of the ink-stand (1 in FIG. **2**), 1-1-4-4 is the front (2 in FIG. **2**), 4-4-5-5 is the bottom and 5-5-8-8 is the back (3 in FIG. **2**). 4-5-6-6 and 4-5-7-7 are the two sides (4 and 5, in FIG. **2**). Cut two square holes 9, 9 for putting the ink wells and two semicircular depressions on the sides as in 10-10 for the pens. Fold the top 1-1-2-2 along 1-1 and stick the flap 2-2 to the back at the dotted line 3-3. Then fold the sides 4-5-6-6 and 4-5-7-7 and stick them to the stand with the flaps 1-4 and 1-4 going inside. The finished model is shown in FIG. **2**.

CARD-BOARD MODELS

1



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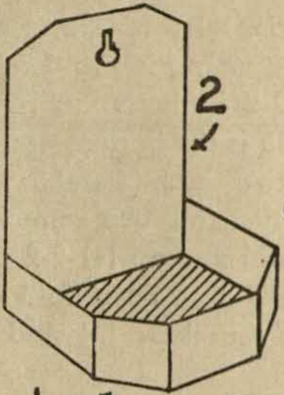

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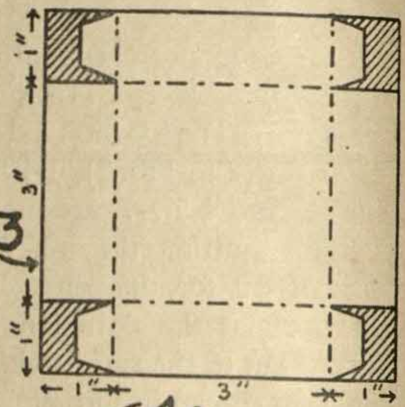

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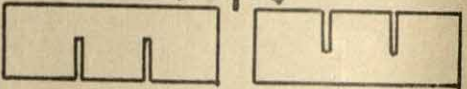

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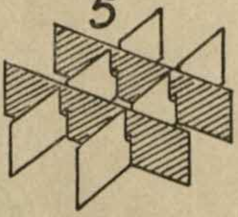

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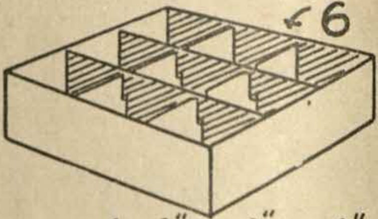

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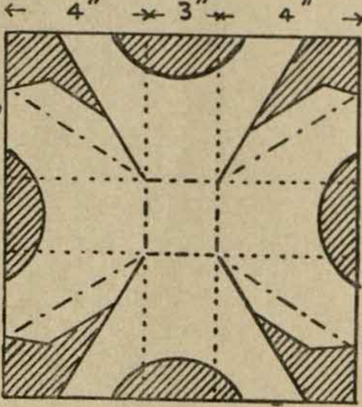

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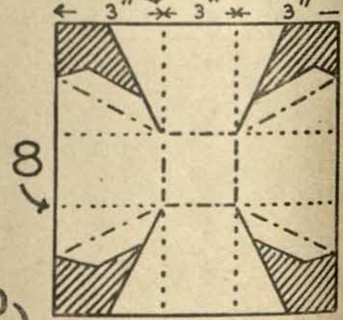

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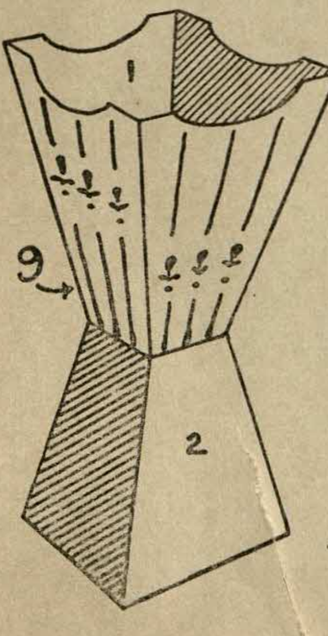

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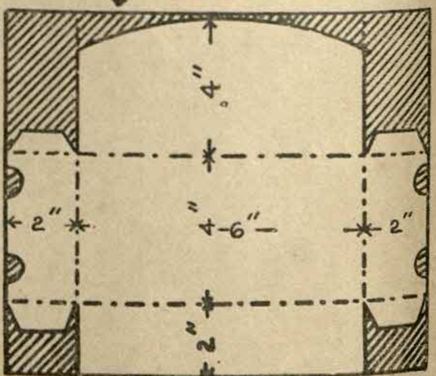

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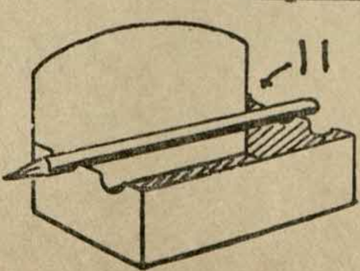


WALL TRAY

Take a piece of cardboard 11″×7″ and draw horizontal lines 6″-2″-3½″ apart and vertical lines 1½″-4″-1½″ apart as in FIG. **1**. Mark the shaded portions carefully. The bottom of the tray has five sides (FIG. **2**) and looks ornamental. Cut off the shaded portions and fold the sides of the bottom along the chain lines and stick them with the flaps as shown in FIG. **2**. Make a hole at the top for the nail.

BOX WITH COMPARTMENTS

This is a square box with nine compartments. Take a square piece of cardboard 5″×5″ and mark a margin 1″ broad all round. This margin is the wall of the box. The middle portion is 3″ square. Cut off the shaded portions in the corners leaving flaps as in FIG. **3**. Fold along the chain lines and stick the sides of the box. Take four strips of card each 3″×1″ and in each of them cut slits half deep and 1″ apart as in FIG. **4**. Fix two strips into the other two as in FIG **5** and fix the whole net into the box as in FIG. **6**. Cut the ends of all the strips a little so that the net may easily go into the box.

Lid

Take another piece of cardboard of the same size as before and mark off a lesser margin leaving a bigger square in the middle. Cut flaps in the corners as in FIG. **3** and make another box which will be the lid.

FLOWER VASE

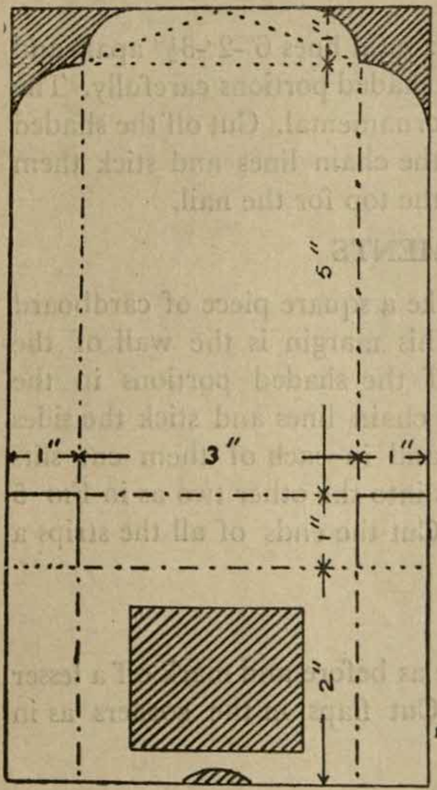
This model has two parts, the top and bottom pieces, as 1 and 2 in FIG. **9**. Take a piece of cardboard 11″×11″ and draw horizontal lines 4″-3″-4″ apart and vertical lines also at the same distances as in FIG. **7**. In the corners provide flaps as shown. Cut off the shaded portions, fold along the chain lines and stick the top piece as 1 in FIG. **9**. Take another piece 9″×9″ and draw horizontal and vertical lines 3″ apart as in FIG. **8**. Cut flaps in the corners as shown, fold the sides and stick them as 2 in FIG. **9**. Invert 2 and stick 1 on it so as to form a vase as in FIG. **9**. Decorate the sides of the top with designs as explained in **Plate 24.** The model can also be used as a stand for keeping pens, pencils etc.

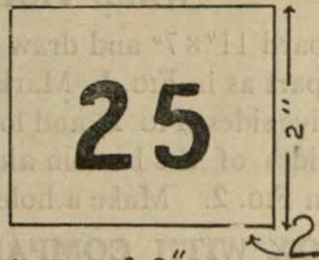
PEN AND PIN TRAY

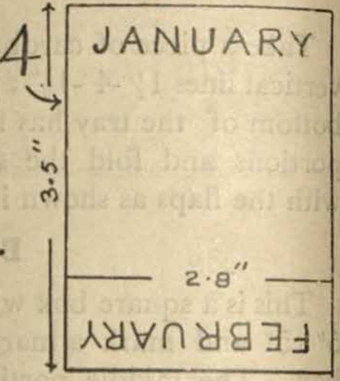
Take a piece of cardboard 10″×10″. Draw horizontal lines 2″-4″-4″ apart and vertical lines 2″-6″-2″ apart as in FIG. **10**. Mark the shaded portions and cut them off. Fold the piece along the chain lines and stick the corners as in FIG. **11**.

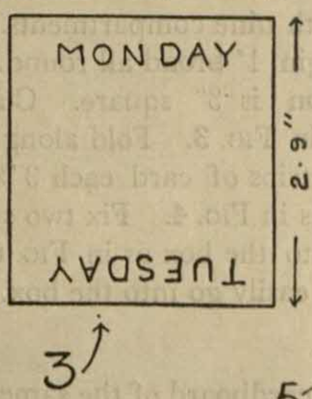
Plate 41

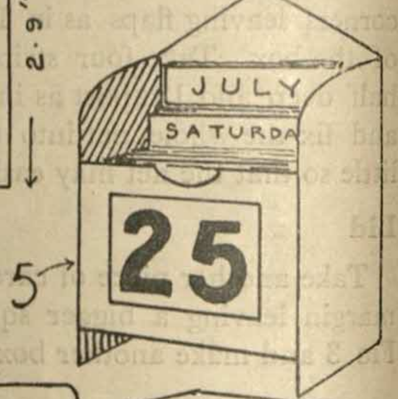
CARD-BOARD MODELS

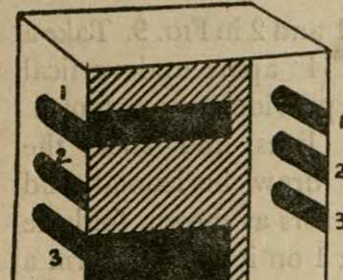


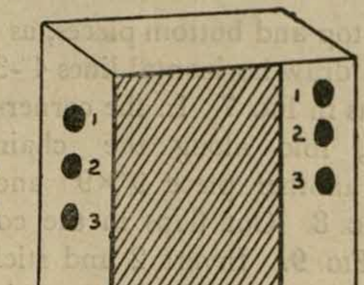


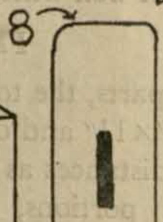


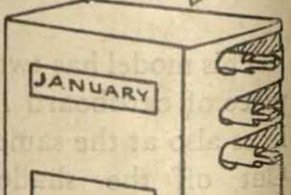


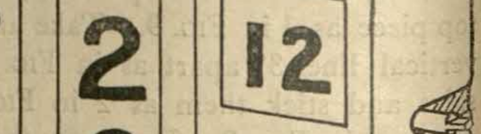












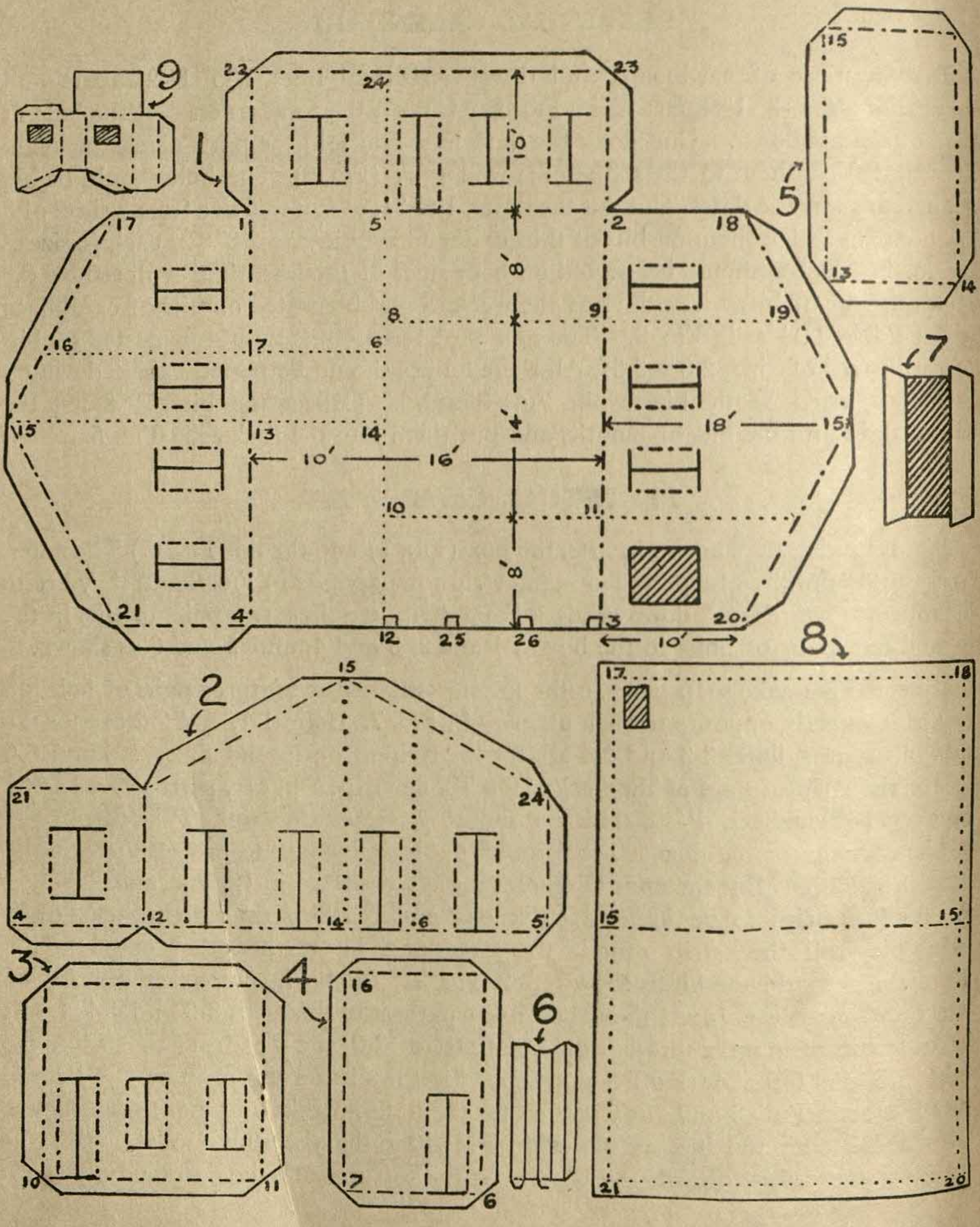
PERPETUAL CALENDAR-I

Take a piece of cardboard and draw horizontal lines 1″-5″-1″-2″ apart and vertical lines 1″-3″-1″ apart as in FIG. **1**. Cut off the top corners and the hole at the bottom as shown. Cut along the dark lines and fold the parts along the chain lines and stick them to the shape of a wall rack (FIG. **5**) The hole should be big enough to show the dates. Cut out the dates, 1 to 31, of suitable size from a sheet of a calendar and stick them on bits of thin card. These bits are 2·8″×2″ each in size as in FIG. **2**. Dates should be pasted on both sides of the bits. This will reduce the total number of bits. The days of the week should be pasted on bits of cardboard of size 2·8″×2·9″ as in FIG. **3**. The names of the months should be pasted on bits of cardboard of size 2·8″×3·5″ All these names should be pasted upside down on the lower ends of the bits as in FIGS. **3** and **4**. Collect the bits of dates, the bits of days and the bits of months and put them into the rack as in FIG. **5**.

PERPETUAL CALENDAR-II

In this model there are two parts, the box (FIG. **7**) and the lid (FIG. **6**.) The dates, weeks and months are pasted on long strips of paper as in FIG. **8** and they are to be rolled upwards and downwards. Each strip requires two pairs of slits in the lid and two pairs of holes in the box as 1 and 2, 3 and 4, and 5 and 6 as shown.

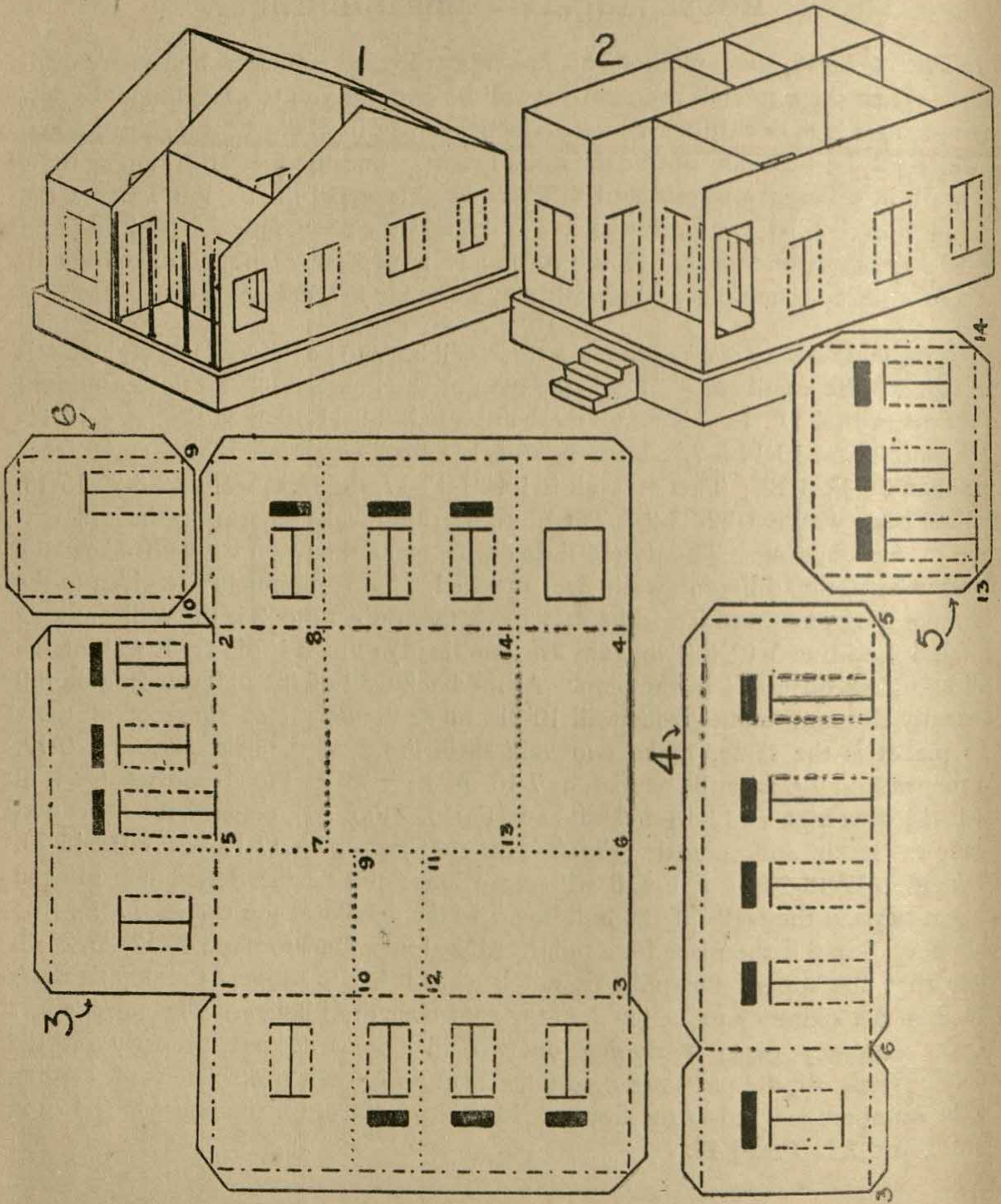
Take a three-cake soap box. In the lower container, mark three pairs of holes on each side exactly opposite to each other as in FIG. **7**. Holes 1-1, and 2-2 are for the strip of months, holes 3-3 and 4-4 are for the strip of dates and holes 5-5 and 6-6 are for the strip of days of the week. On a long strip of paper, paste dates 1 to 31 from a calendar sheet. Paste days and months on separate strips. Take three pairs of bits of cane or bamboo which should be long enough to project through the holes in the box. Cut the ends of each cane bit as shown in 1, FIG. **9** and also cut a slit for the strips to be inserted. Fix one end of the strip into the slit of a cane bit, roll the strip round the cane and insert the other end into the slit of the second cane bit as shown in 2, FIG. **9**. Similarly prepare the strips of weeks and months. Insert the cane bits of dates into the holes 3-3 and 4-4. Insert the cane bits of months through the holes 1-1 and 2-2, and the bits of weeks into the holes 5-5 and 6-6. Mark off the positions for the slits on the sides of the lid and cut them as in FIG. **6** and cut windows for the dates, weeks and months as shown. Put the lid over the box as shown in FIG. **10** and finish the model. Roll the cane bits every day towards the bottom or the top to show the date and the week.


10′
8′
14′
16′
18′
10′
16′
8′
10′

HOUSE MODELS—GABLED HOUSE

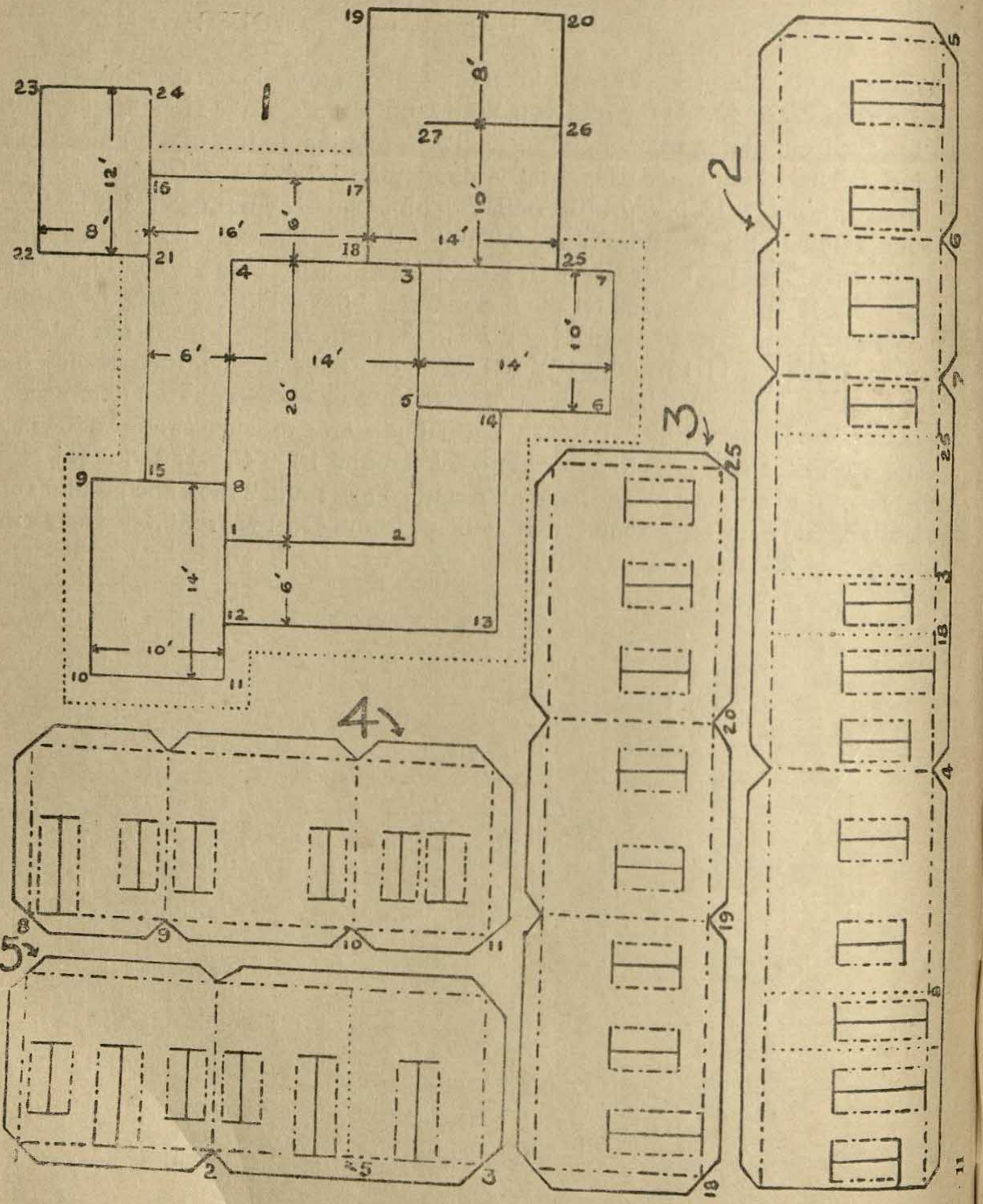
In **Plates 42-46,** some methods of making cardboard models of houses are dealt with. When these models are made, it will be easy for you to plan and make new types of buildings in cardboard. The model shown in **Plate 42** is a gabled house in which all the walls are not of the same height. Because there is a sloping roof, the walls at different places are of different heights as per plan. FIG. **1** shows the ground plan 1-2-3-4, the back wall 1-2-23-22 and the two side walls 1-4-21-17 and 2-3-20-18, all in one piece. If the cardboard is not large enough to contain all the above parts in one piece, the walls may be made in separate pieces.

The dimensions are marked in feet, which will have to be reduced to a scale to suit the size of the cardboard. Draw the plan of the house on a sheet of cardboard as shown in FIG. **1**. In this house there are a hall 8-9-11-10, a bed-room 4-13-14-12, a store-room 13-14-6-7, a kitchen 7-6-5-1, a back verandah 5-2-9-8 and a front verandah 10-11-3-12. The left wall is 1-4-21-15-17, the right wall is 2-3-20-15-18, and the back wall is 1-22-23-2. There are partition walls separating the different parts of the building. The dotted lines on the ground and on the walls show the places where the different walls are attached. Same numbers are given to the corresponding parts and it will be easy to fix them up. FIG. **2** is the wall standing on the dotted line 5-12-4 (two walls are combined). FIG. **3** is the front wall of the hall standing on 10-11 in the plan. As the back wall of the hall standing on 8-9 is exactly the same as the front wall 10-11 and as the height of the roof at these two places is the same, make two walls as in FIG. **3** to the height equal to 9-19. As the wall on 7-6 must be as high as 7-16, make it as in FIG. **4** and as the wall on 13-14 is as high as 13-15 make it as in FIG. **5**. FIG. **7** shows how the doors and windows are cut and opened. FIG **8** is the roof resting on 17-15-21 and 18-15-20. Make it as 17-18-20-21 of FIG. **8** with extra space outside the dotted line so as to project beyond the walls of the building. Make a hole at the corner 17 for the chimney. FIG. **6** is the piece for a pillar. Make four pillars to stand on 12, 25, 26, 3. Note that the top of the pillar is not level as it has to support the sloping roof. FIG. **9** is the chimney to be fixed on the roof over the kitchen. The lower edges of the chimney piece is sloping on two sides so as to rest properly on the roof. When all the parts are made, fix them up in their proper places according to the numbers marked in the figures. Make a platform for the house as shown in FIGS. **1** and **2** in **Plate 43.**



HOUSE MODELS—I. TERRACED HOUSE

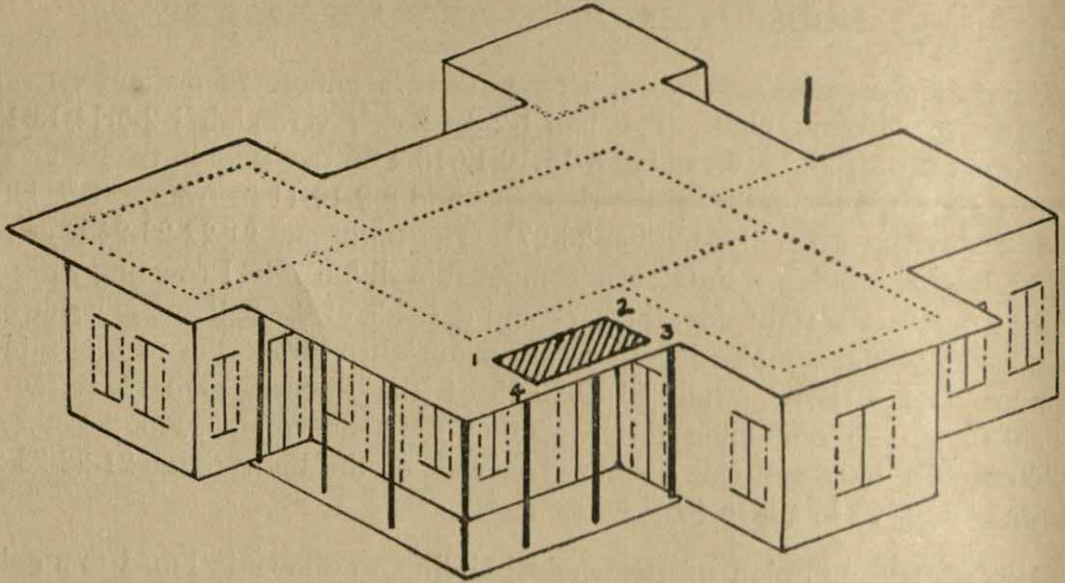
This terraced house (Fig. **2**) is made on the same ground plan as the gabled house explained in **Plate 42.** As the roof is flat, all the walls are of the same height. The height of this building may be taken as 12′ in relation to the other dimensions marked in the plan. Fig. **3** shows the ground plan 1-2-4-3 in which 4-6-13-14 is the front verandah, 13-14-8-7 is the hall, 7-8-2-5 is the back verandah, 3-6-11-12 is a room, 11-12-10-9 is the store room and 10-9-5-1 is the kitchen. One of the side walls is on 1-3 and the other side wall is on 2-4 and the back wall is on 1-2. Make a wall 3-6-5 in Fig. **4** to stand on the line marked 3-6-5 in Fig. **3**. Make two walls like 13-14 in Fig. **5** to stand on 13-14 and 7-8 in the plan. Make two walls like 9-10 in Fig. **6** to stand on 11-12 and 9-10. Of these two walls the one that stands on 11-12 need not have any door. The wall on 9-10 has a doorway as in Fig. **6** which opens into the kitchen 10-9-5-1. Cut ventilators above the doors and windows as shown. Make the roof so as to cover the whole ground 1-2-3-4 and also to project a little beyond, to serve as a sun-shade all round. Figs. **1** and **2** show the positions of the walls inside before the roof is fixed. Steps leading to the front verandah are shown in Fig. **2**.

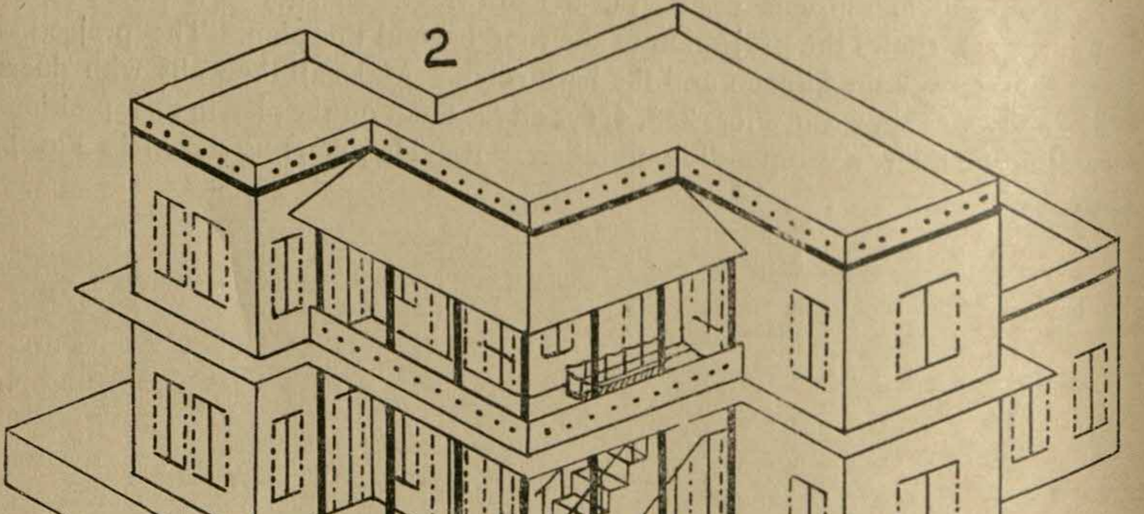


HOUSE MODELS—II. TERRACED HOUSE

This model is more advanced, because there are more rooms and verandahs. FIG. **1** is the ground plan. The hall 1-2-3-4 has a verandah 1-2-5-14-13-12 on two sides in front and a verandah 8-15-16-17-18-4 on two sides in the back. There are two rooms, one 3-5-6-7 on the right side and 8-9-10-11 in front. The kitchen 18-19-20-25 has a small partition 26-27. The bathroom 21-22-23-24 is attached to the back verandah. FIG. **2** is a combined wall 5-6-7-4-11 covering three sides of the room on the right side, the back and one side of the hall and one side of the front room. Such combined walls can be made when the cardboard is of sufficient length. FIG. **3** is the wall 18-19-20-25 of the kitchen. FIG. **4** is the wall 8-9-10-11 of the remaining three sides of the front room. FIG. **5** is the wall 1-2-3 of the hall and side room. The wall of the bath room 21-22-23-24 is shown in FIG. **13** in **Plate 46.**

Draw the ground plan of the whole building as shown in FIG. **1** to a reduced scale, from the measurements given in the drawing. The dotted line around the plan in FIG. **1** shows the projection of the roof beyond the plan. The projection is not shown over the kitchen and the bath-room. Make all the walls with doors and windows as shown in FIGS. **2, 3, 4, 5,** and fix them on the plan in their positions according to their corresponding numbers. Provide pillars as shown in FIG. **1, Plate 45.**

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HOUSE MODELS—III. TERRACED HOUSE WITH FIRST FLOOR

Fig. **1**. shows the house model explained in the previous lesson, with the roof added.

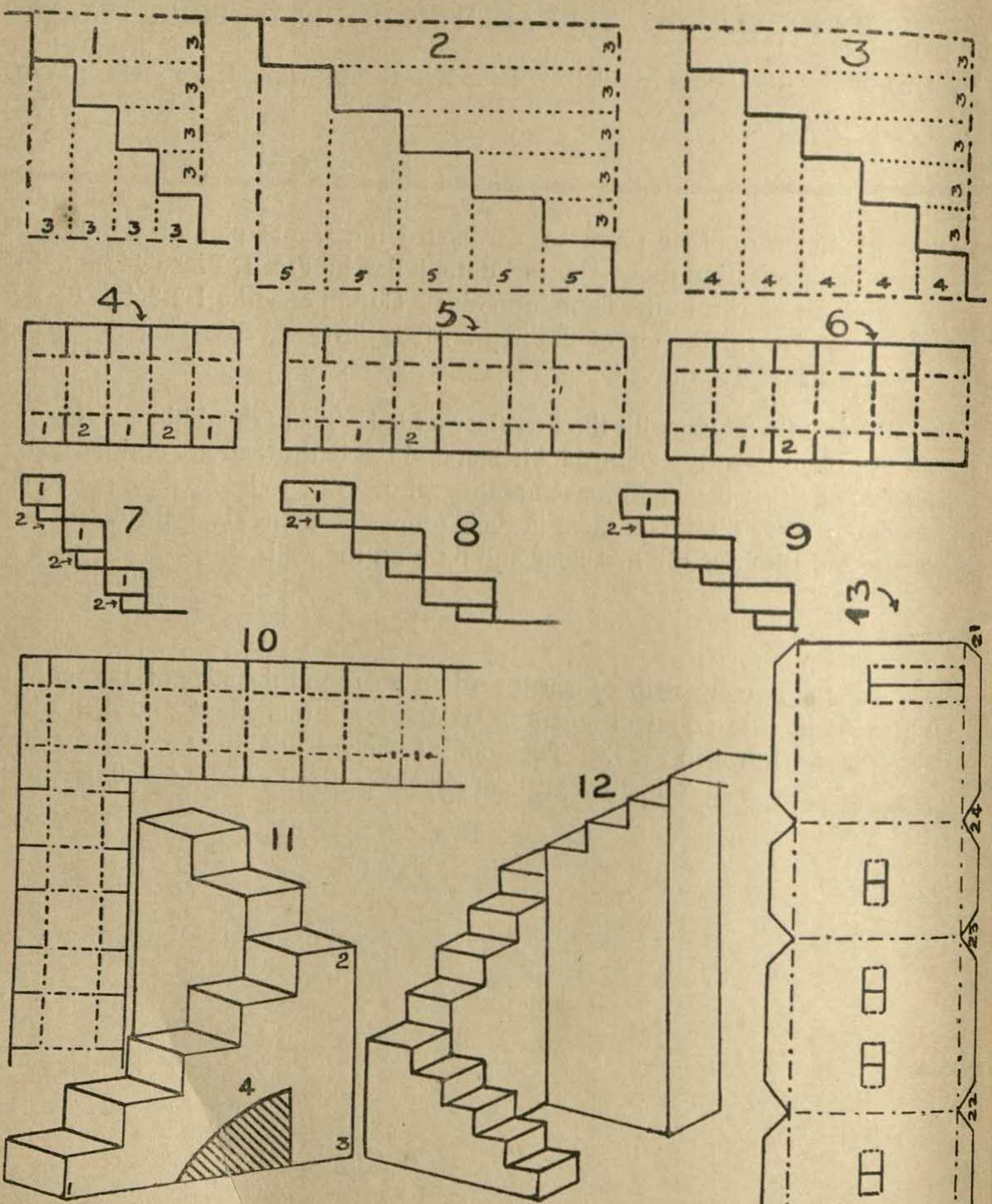
Roof

Draw again on another piece of cardboard the whole plan of the building including the projection shown by the dotted line in Fig. **1, Plate 44**, and fix it on the walls as shown in the figure opposite. Cut an opening 1-2-3-4 in the roof over the verandah for the top of the steps. The process of making the steps is explained in **Plate 46**.

Fig. **2** shows the house with the first floor added. There should be another plan for the first floor. In this plan the kitchen and the bath-room are omitted. Draw the plan of the first floor and make another set of walls to be fixed on the roof of the model in Fig. **1** and fix them in their proper positions along the dotted lines. Make another roof for the first floor and fix it on the walls.

Parapet

Take a long narrow strip of cardboard to go round the edge of the roof and punch holes in it at equal distances to make it look ornamental, and then stick it on the roof as shown in Fig. **2**. The roof of the verandah on the first floor may be sloping. The pillars in the first floor should be fixed exactly over those in the ground floor.



HOUSE MODELS—IV. STEPS

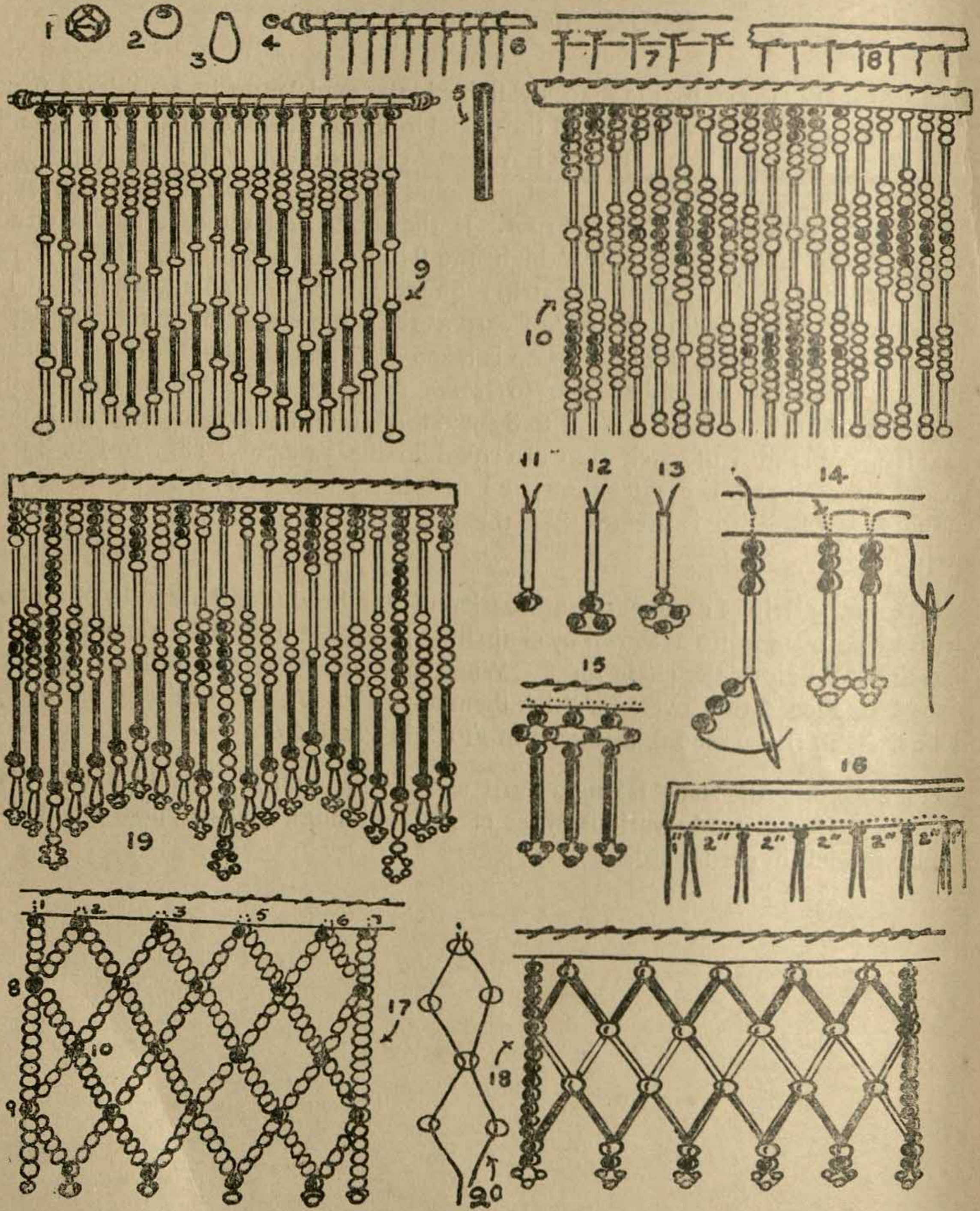
Before making the steps, the space available in the model must be considered first. For example, the front verandah in the model in **Plate 44** is shown as 16′ long and 6′ broad on the right side. If this is reduced to a scale of 1″ to 2′ the verandah will be 8″ long and 3″ broad. The steps should be made to fit into this space and also to reach a height of 6″ to the roof. If the height and the base are taken to be equal and if each step is 0·5″ high and 0 5″ broad, there will be twelve steps rising at a slope of 45°. Then the strip required for the steps should be 12″ at 1″ for each step with an addition of ½″ of card at the bottom and top to serve as flaps for sticking. If the length of each step is taken as 1″ an additional half inch space is to be provided on either side to serve as flaps. The whole strip must be 13″ long and 2″ broad. Figs. **1** to **3** show three different slopes. In Fig. **1** the height and breadth of each step are equal in the ratio of 3 : 3. In Fig. **2** the breadth of each step is greater than the height in the ratio of 5 : 3, and is less steep. In Fig. **3** the breadth is greater than the height in the ratio of 4 ; 3 and is more steep.

Take a long strip of cardboard and mark on it the heights and breadths of all the steps and draw margins as shown by chain lines in Figs. **4** to **6**. Cut along the dark lines and fold along the chain lines. When the steps are folded to shape, the bits 1 and 2 in Figs. **4** to **6** overlap. Stick them as in Figs. **7** to **9**. The steps are ready to be fixed in the verandah as shown in Fig. **2** in **Plate 45.**

Fig. **10** shows the steps taking a turn as 2-3-4 in Fig. **11.** Fig. **12** shows two turnings. If you study various types of real buildings, you can plan and make similar models in cardboard.

Plate 47

BEAD CURTAINS

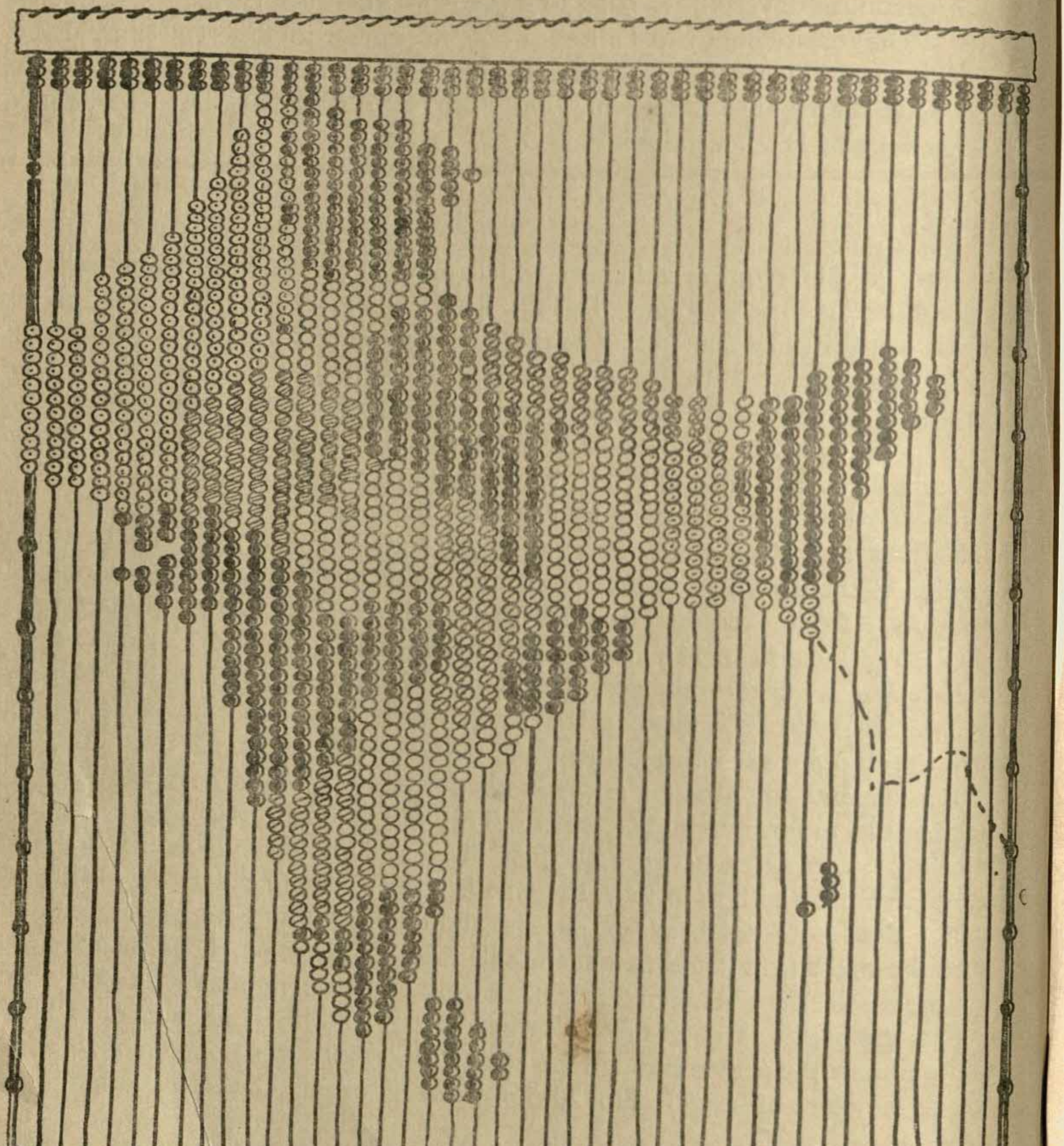


BEAD CURTAINS

Bead curtains are very interesting to make. Making such curtains in attractive designs is a favourite hobby of ladies. Beads are made in different sizes, shapes and colours as in Figs. **1** to **3**. There are glass beads, porcelain beads and plastic beads. Glass beads are transparent. There are also glass tubes which can be used in the making of bead curtains.

Support

A bead curtain requires a hanger which may be of wood like a map roller, a metal tubing or tape as shown in Figs. **6** and **7**. Fig. **5** is a glass tube. Keep with you plenty of beads and tubes of different colours and then begin work on the curtain. Take a reel of strong twine or cotton thread and cut it into suitable lengths according to the size of the curtain. Tie them on the rod as in Fig. **6** or on a piece of tape as in Fig. **7** at regular intervals. If you use tape, tie the pieces of thread at the middle of the tape as in Fig. **7** and fold and stitch the edges as in Fig. **8**. Lay the whole thing flat on the ground so that the beads or tubes do not drop off. Fig. **9** shows a pattern which you can easily copy. The designs can be varied according to the variations in the number of beads or tubes and also according to the colours. After the required length is reached, the ends are to be worked as shown in Fig. **19**. Figs. **11** to **14** show the method of working the ends. Fig. **15** shows how each line is joined to the next line. Fig. **10** is another pattern. Fig. **16** shows how a net-like curtain is made. Here bits of twine are attached to the hanger in pairs at each point excepting the first and the last which are single bits. The first and the last bits are straight and the middle bits are looped together with the adjoining bits to form diamond shapes. This can be done correctly by counting the beads. The space between the first bit 1 and the second bit 2 is half the space between 2 and 3 as in Figs. **16** and **17**. The shaded bead is of a different colour. First string the beads on the first and the last bits. String some beads on one of the two bits at 2 and pass the needle through the colour bead 8 and string as many beads as are between 2 and 8. String the same number of beads again and pass the needle through the colour beads at 10 and the same number of beads again and pass the needle through the colour bead at 9 and so on. Fig. **18** shows tubes in the place of beads. Fig. **20** shows linking of one line with another.

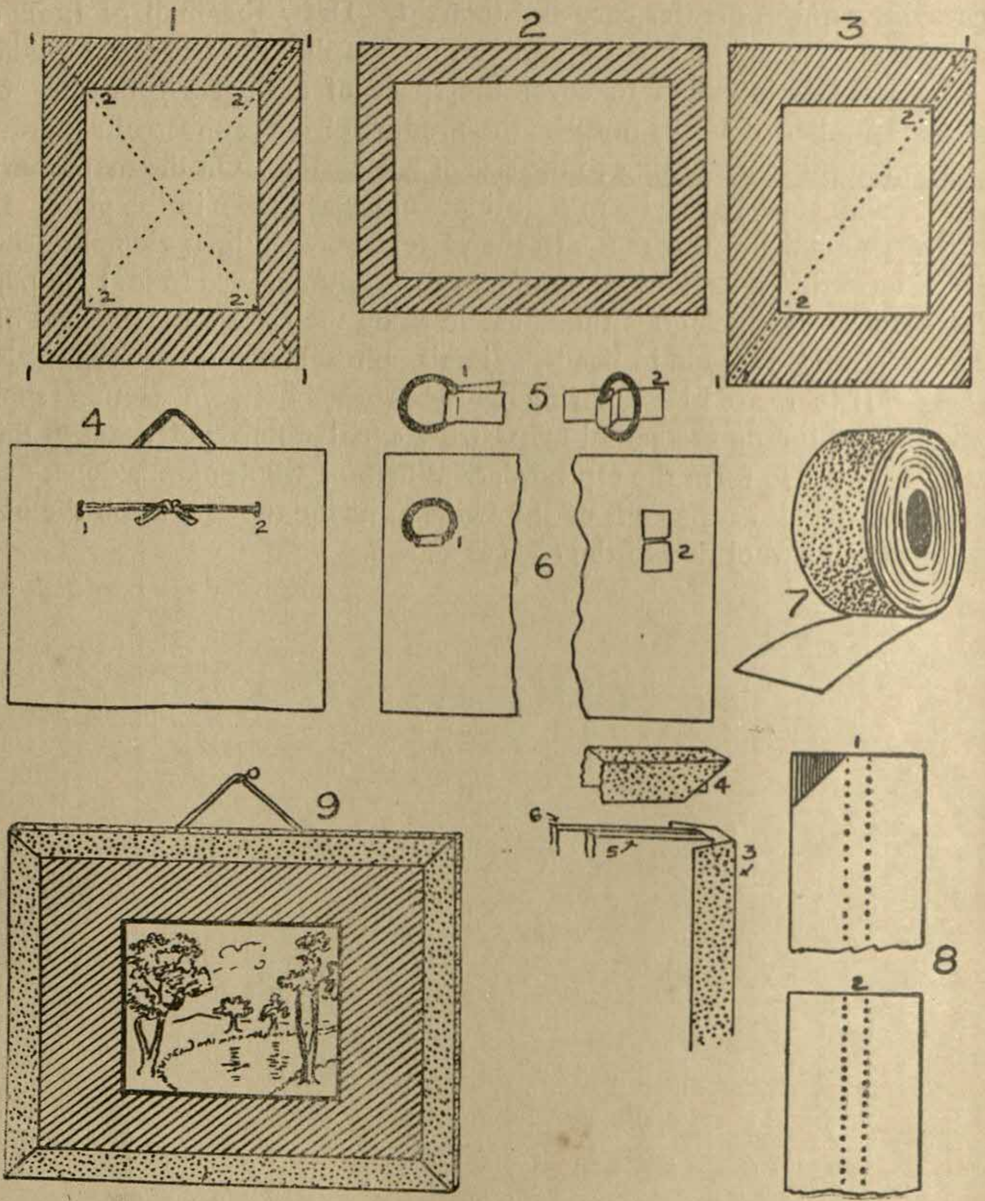


INDIA IN BEADS

Plate 48

This curtain requires greater care and thought. Draw the map of India on a sheet of graph paper. The small squares on the graph sheet serve as a guidance. When the curtain is intended to cover the space of a doorway or any other big area, the number of beads must be the product of the number of squares and any convenient number according to the size of the curtain. On the map, mark all the states. Each state has to be in a distinct colour as shown in the plate. Light blue may be assigned for the sea. In the plate, wherever lines alone are shown, they cover the portion outside the boundary of the country. This outside portion may be filled up by stringing glass tubes, as shown on the right and left edges of the maps. Just as India is made in beads, animals, birds, landscapes etc. may also be made in beads. If there are islands, string light blue beads between the tubes showing the sea. Before beginning the actual map, string equal number of beads at the top of each bit of twine to form the top border. When the whole map is done, put the same number of beads at the ends of the twine as at the top and finish the bottom border with tufts of wool tied to the ends as shown.

Plate 49 PASSE-PARTOUT FRAME



PASSE-PARTOUT FRAME

Sometimes you may have too many pictures to frame and it will be very costly to frame them all in wood. For big pictures you should have wooden frames, and for small pictures you can use passe-partout, calico paper or calico cloth for framing. Passe-partout is an adhesive paper, Fig. **7**, available in different colours but costlier than calico. If you use calico paper or cloth, cut it into strips of suitable length and breadth. Before a picture is framed it has to be pasted on a mount of a suitable colour to form an agreeable background. Fig. **1** shows a mount (shaded) with a picture on it. The diagonals of the mount 1-1 are coincident with the diagonals 2-2 of the picture. The margin all round is not of the same breadth. Only the margins on the opposite sides are equal. In Fig. **2** the diagonals of the picture and the mount do not coincide, but the margin all round the picture is uniform. In Fig. **3** only one diagonal of the picture 2-2 coincides with the diagonal 1-1 of the mount. In Figs. **1** and **2** the picture is in the centre of the mount. In Fig. **3** the picture is placed nearer one of the sides of the mount. Any one of the arrangements shown in Fig. **1, 2** and **3** may be chosen according to your taste. The colour of the mount may also be according to your choice.

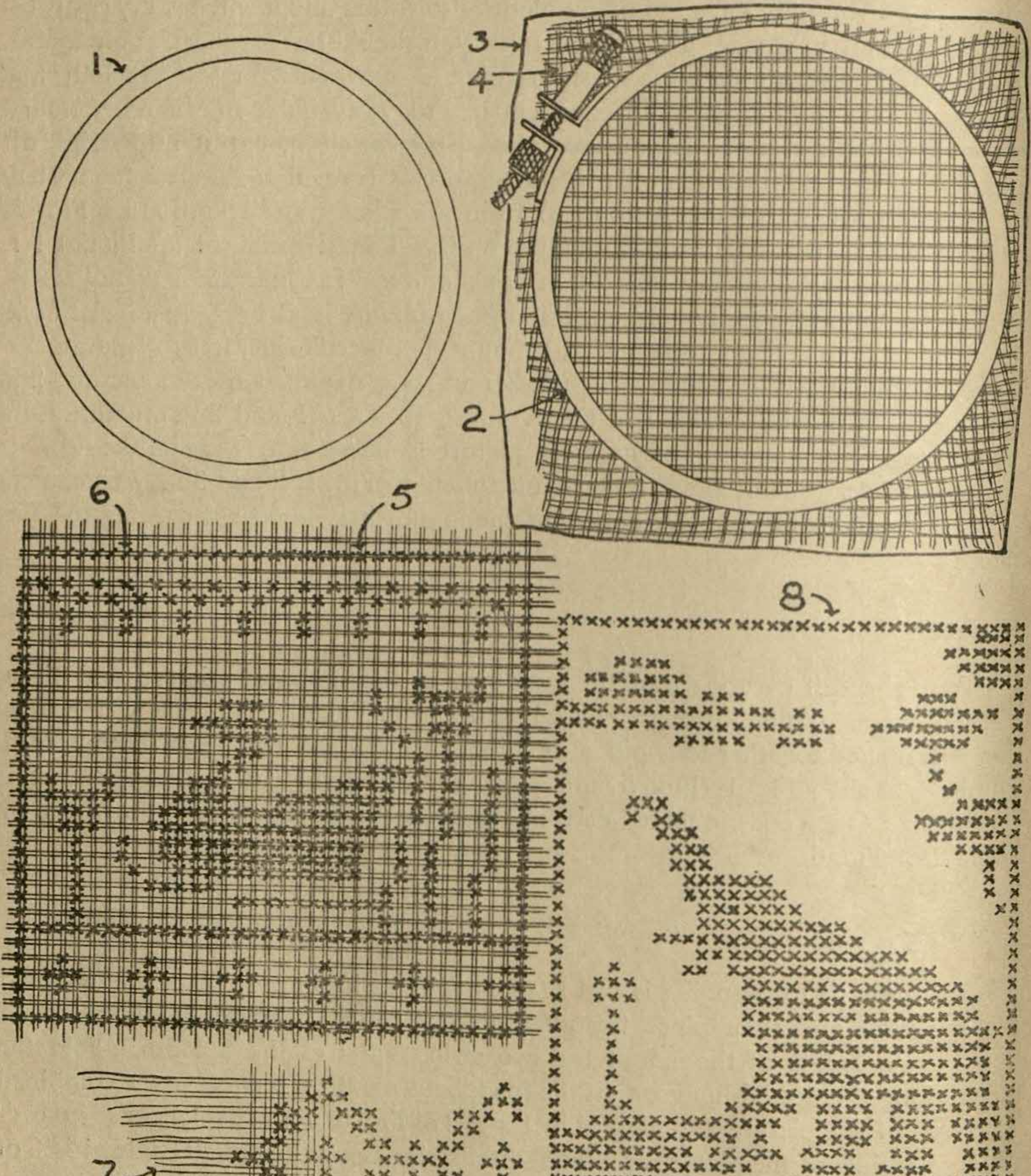
Hanger

Take a sheet of cardboard of the same size as the mounted picture and tie a piece of tape passing through holes 1 and 2 as in Fig. **4**. The ends of the tape may be stitched together to avoid a bulging knot. Take two rings with folded tin pieces as shown in 1, Fig. **5** and pass them through two slits made in the cardboard. Open out the folded ends of the tin pieces as shown in 2, Fig. **5** and in 1 and 2 of Fig. **6**.

Framing

After the tape for hanging is tied to the board as in Fig. **4**, place the mounted picture on it and then place the glass on it. Cut two strips of passe-partout equal to the length of the mount and two strips equal to the breadth. Fold the strips along the dotted lines so that the space between them is equal to the combined thickness of the picture and glass as in 1 and 2 of Fig. **8**. Paste the longer strips over the longer sides of the picture and the shorter strips along the broader side as in 3 of Fig. **8**, holding the picture and glass, 5 and 6 of Fig. **8**. Take the other two strips and cut off the shaded corners as in 1, Fig. **8**, at an angle of 45° and paste them over the broader sides of the picture as in 4, Fig. **8**. The finished frame is shown in Fig. **9**.

Plate 50 CROSS STITCHES

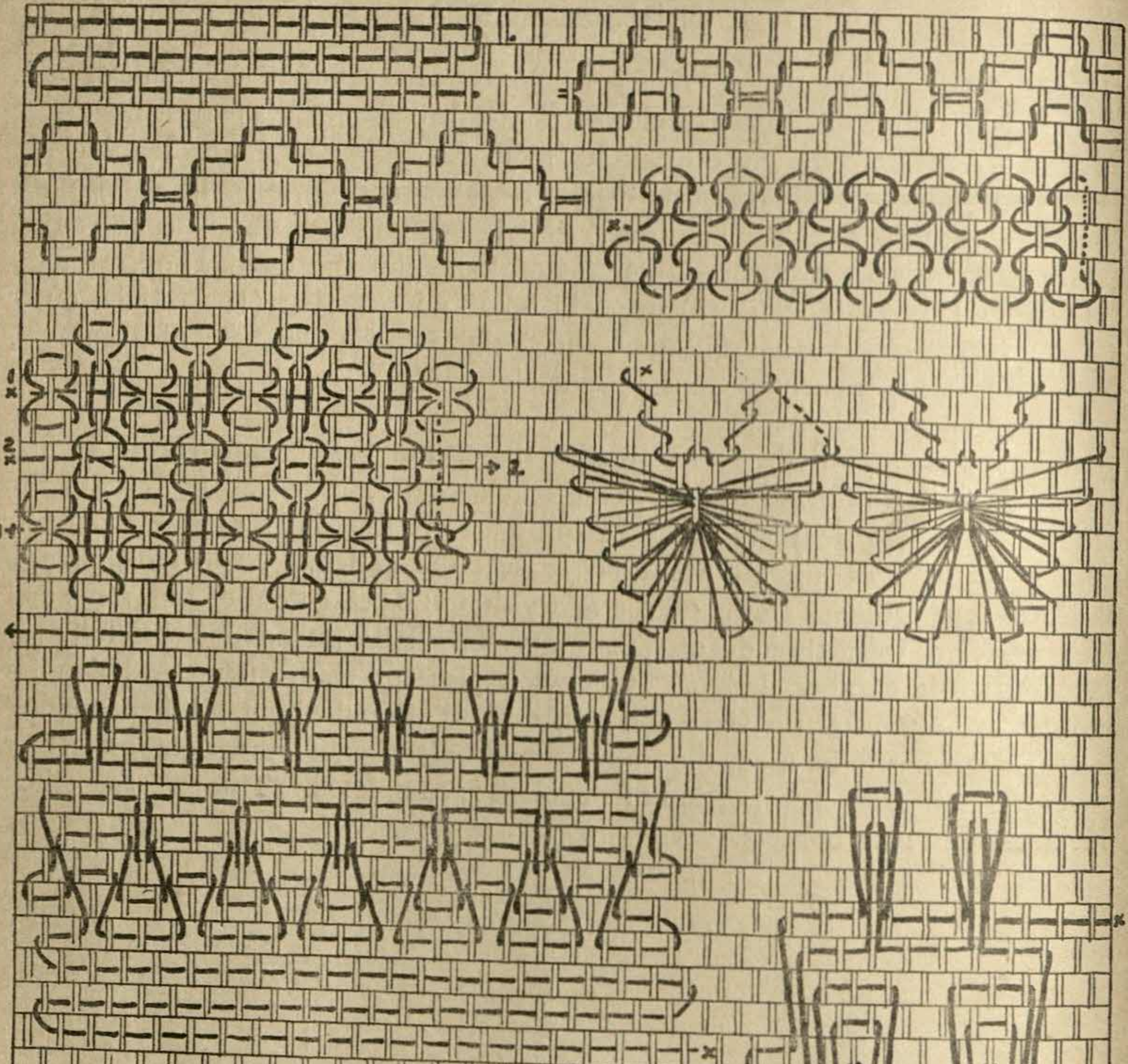


CROSS-STITCHES

Cross-stitches are another form of embroidery. Even young children can do it easily. This is done on a piece of cloth. To help to count the squares and lay the cross-stitches correctly, a piece of matty cloth is placed on the ordinary cloth. For all embroidery work a frame is used. It has two rings, one fitting into the other as in FIGS. **1** and **2**. The inner ring is a complete one and the outer ring has two ends with a screw for tightening or loosening the ends. The ordinary cloth (3) and the matty cloth (4) are laid on the inner ring (1) and the outer ring (2) is pressed down on it and secured tightly with the help of the screw, taking care that there are no creases in the cloth.

FIG. 5 shows cross-stitches. In stitching the crosses one diagonal is stitched first in a row as in 6, and the cross diagonal is stitched later, so that all the crosses are uniform. In the figure, there is a duck and there are trees in front and back of it. Different colours of thread are used to suit the design. When the design is completed, the ordinary cloth and the matty should be taken out of the frame and the warp and weft threads of the matty should be pulled out carefully as in 7. FIG. **8** is another design. It shows a piece of cloth after the design has been stitched and after the warp and weft threads are pulled out. When a larger piece of cloth has to be used, the frame should be shifted to the right or left or above or below after each portion of the cloth is completed. Thus we can stitch wide areas and long borders.

Plate 51 STITCHING ON TOWEL CLOTH



STITCHING ON TOWEL CLOTH **Plate 51**

This is another kind of stitching which is very popular. By this method, bags, curtains, table-cloth etc., can be stitched. The stitching is usually done on one side of the towel cloth. The thread passes under and over the warp and weft threads. Some suggestive designs are shown in **Plate 51** and many more can be designed. The black lines show the course of the thread. The cross marks indicate the places where the stitch is begun and the arrow shows the end. The dotted line shows the thread on the other side of the towel.

GENERAL

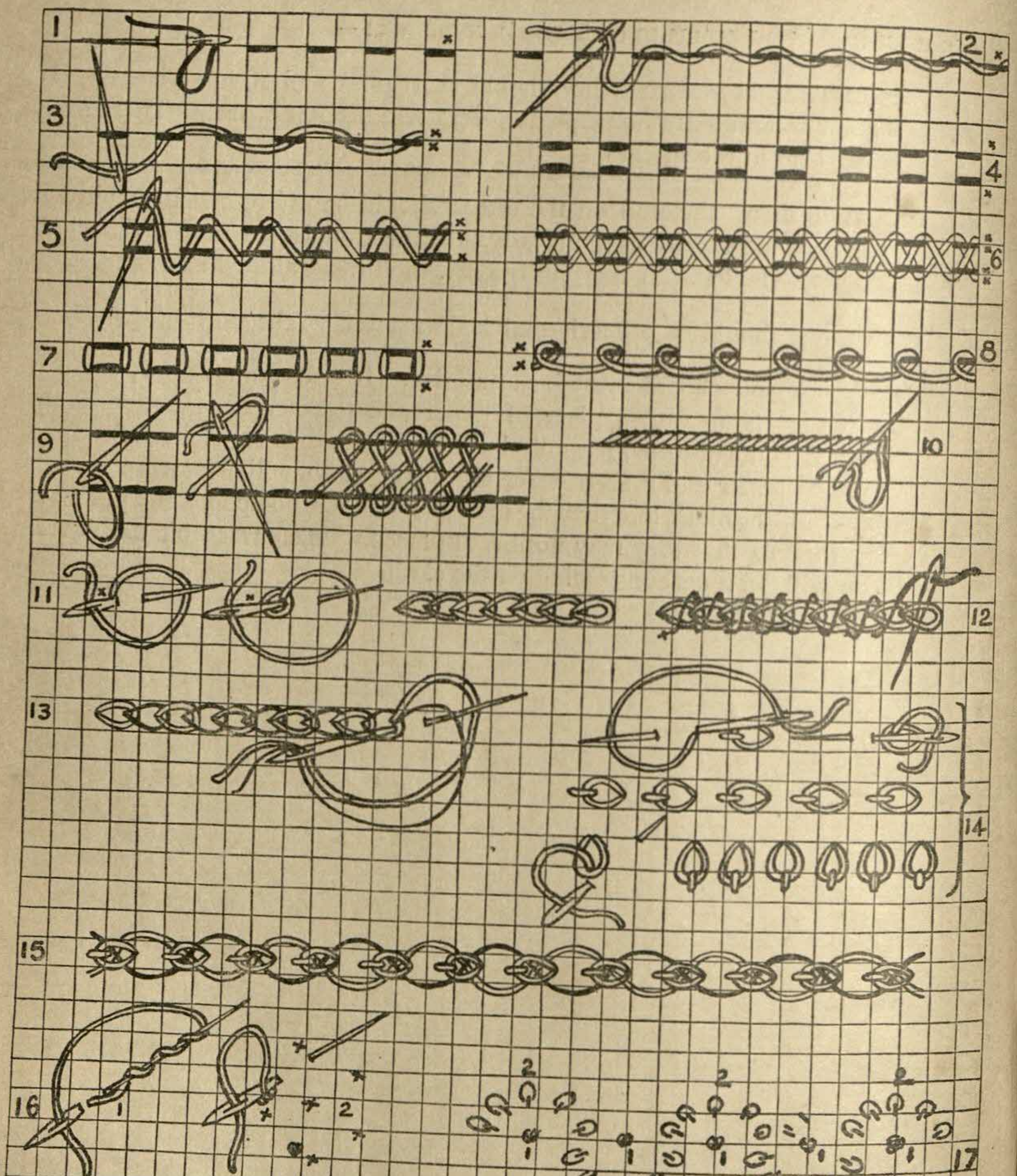
Embroidery is a useful and interesting pastime and it can be learnt by anyone, young or old. It can be lucrative too. You can embroider kerchiefs, ties, dresses, table covers, curtains, lamp shades, toys and any fabric that you use in your household. There are numerous kinds of stitches, the names of which make a long list. The various stitches are shown in **Plates** 52 to 57. The most important stitches are the **running stitch, stem stitch, chain stitch, fly stitch, flat stitch, long and short stitch, button-hole stitch, cross stitch** etc. These varieties are shown in the above plates in various stages. Dark lines indicate change in colour of the threads. Any number of colour threads can be used in a pattern. In choosing the colour you may be guided by the colour combination given here. There are three primary colours, red, blue and yellow; red and blue give violet, blue and yellow give green and yellow and red give orange. Generally when all the three primary colours are introduced into the design in a lesser or a greater degree the result will have a pleasing effect on the eye. For example, when you are using a red cloth for base, the design on it may be of blue and yellow threads, or light orange and light green. When the base is yellow, the design may be stitched in red and blue or their combinations. A large number of colour threads in skeins of simple colours or of graded shades of the same colours are available in the market. While learning embroidery you must practise the stitches on waste cloth till you acquire some steadiness.

EMBROIDERY

The most important points to be borne in mind are:—

1. The intervals between stitches should be regular and of equal length. If regular intervals are not kept, the work will become clumsy. There must be rhythm in the stitches.
2. The strength of the pull on the thread should be uniform. It should not be pulled too tightly or too loosely. If the pull is too much, the cloth will get wrinkled. If the pull is loose, the thread also will be loose.
3. The colours should be properly matched as stated on the previous page.
4. The design you choose must be attractive. If you cannot draw, you can trace nice figures on a piece of paper and transfer them to the cloth. Even if you can draw, it would be better if the drawing is made first on a piece of paper and then transferred to the cloth. First place a carbon paper on the cloth, and then the drawing on the carbon paper and pin them together so that they may not be displaced. Then trace on the figure. You will get a carbon tracing on the cloth.

Plate 52



There are several kinds of stitches—**running stitch, stem stitch** and **chain stitch** etc., as stated already.

RUNNING STITCH

This is done by simply passing the thread at regular intervals in a straight line or a curved line. This is useful for marking the outline of the drawing. Other kinds of stitches can be made along this. Dark lines and double lines show the change of colour. FIG. **2** shows running stitch in one colour. Another colour is used for the stitch that goes through the running stitch. FIGS. **3** to **9** show different types of running stitch.

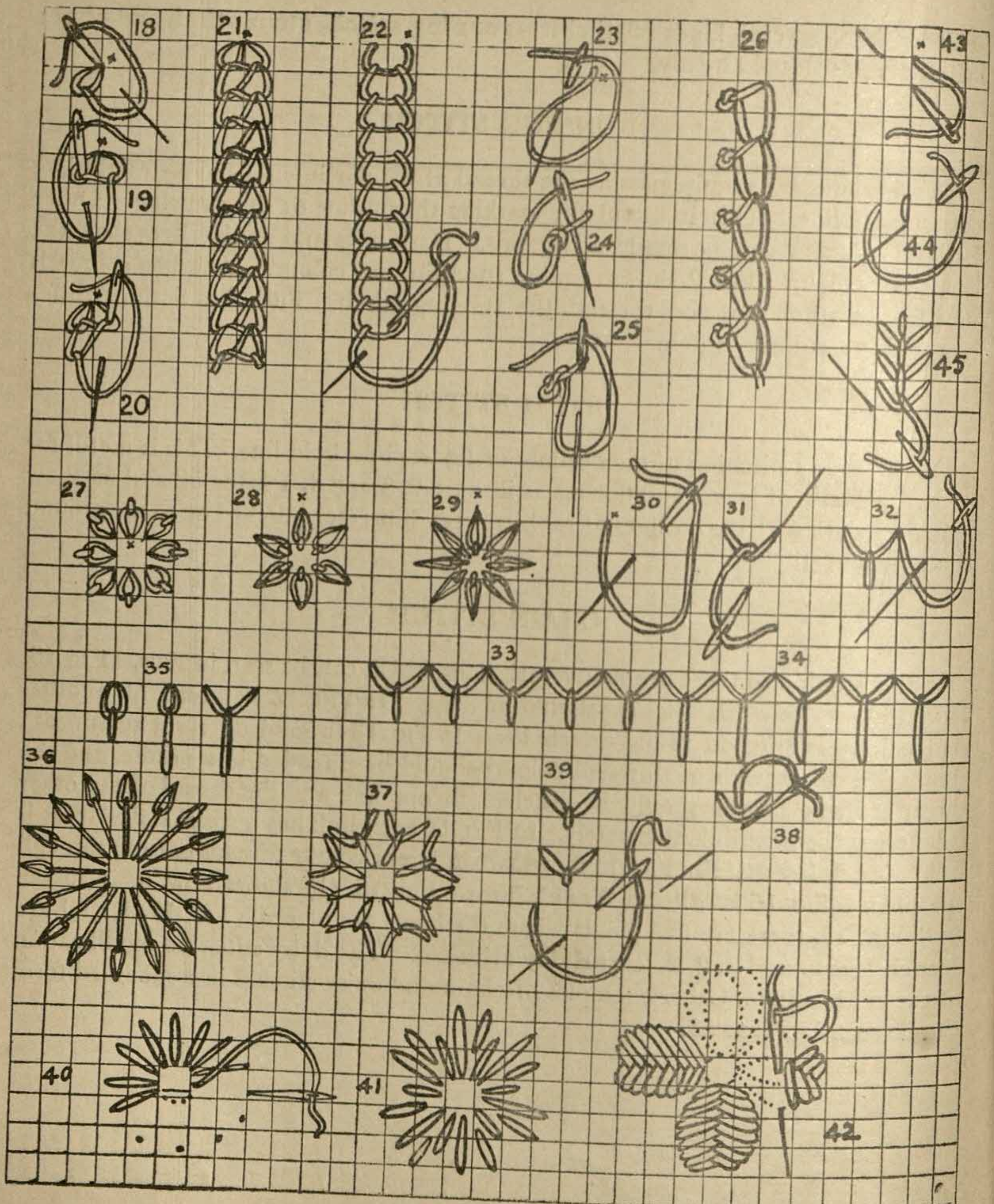
STEM STITCH

FIG. **10** shows stitching of the outlines of figures in a bold line. This is useful for stems and stalks of leaves and flowers as in FIGS. **2, 3** and **4. Plates 58** and **59** show applique-work with the outlines of rabbits, trees, hills, etc., stitched on to the ground cloth in stem stitches.

CHAIN STITCH

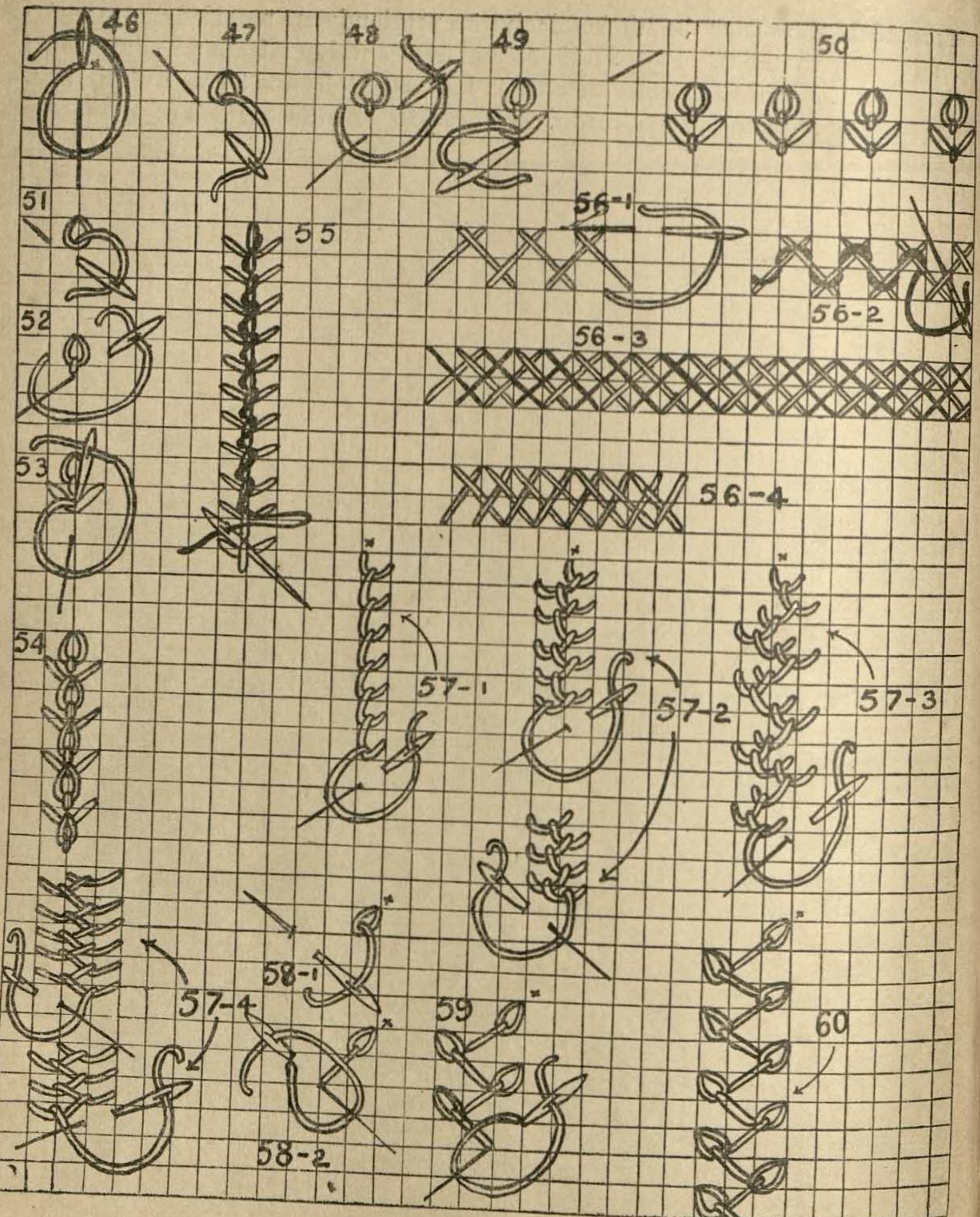
In this stitch also there are many variations which can be seen in FIGS. **11** to **15.** FIG. **11** shows how this stitching should be done. In FIG. **12** a thread of a different colour is stitched round the chains. In FIG. **13** links of different colours are shown. Two threads of different colours should be threaded in a needle, and the thread of one colour should be stitched in one link and the thread of the other colour in the next link alternately. In FIG. **14** each link has a small stalk. This is called the **daisy stitch.** FIG. **15** shows two different colour threads passing through the links. FIG. **16** is called a **french knot.** FIG. **16** (1) shows how it is made. In 2, FIG. **16**, there are five points where the knots are placed. FIG. **17,** 1,1,1,1 are **french knots** and 2, 2, 2, 2 are **daisy stitches.** The daisy stitch is a modification of the chain stitch. Other examples of chain and daisy stitches in a modified form can be seen in **Plate 53.**

Plate 53



FIGS. **18-26** show how the stitches dealt with previously are modified due to variations in their methods. FIGS. **27-29, 35** and **36** are **daisy stitches**. FIGS. **18-26** show also some forms of **chain stitches**. FIGS. **30-34, 37** and **38** are **fly stitches.** FIGS. **40-42** show some flower forms. FIGS. **43-45** show the method of joining **fly stitches.**

Plate 54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56-1
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56-2
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56-3
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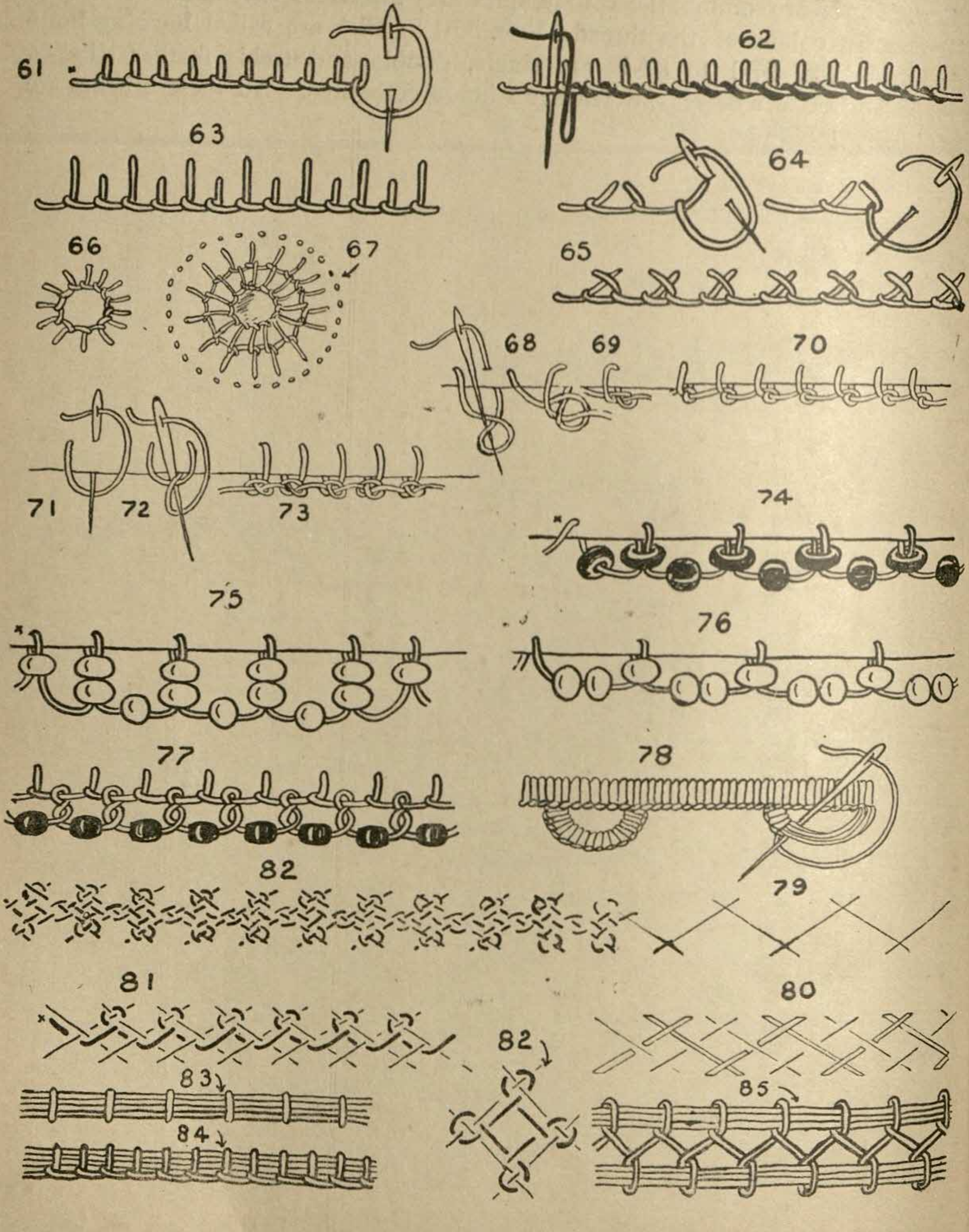
56-4
54
57-1
57-2
57-3
57-4
58-1
59
60
58-2

FIGS. **46** to **55** are combinations of **fly** and **daisy stitches.** The dark lines indicate difference in colour of the thread. FIGS. **56-**1 to **56**-4 are called **herring-bone stitches.** FIGS. **57-**1 to **57-**4 are single, double and treble feather stitches. FIGS **58-**1 to **60** are daisy and feather stitches combined. All these stitches are useful for stitching borders.

Plate 55

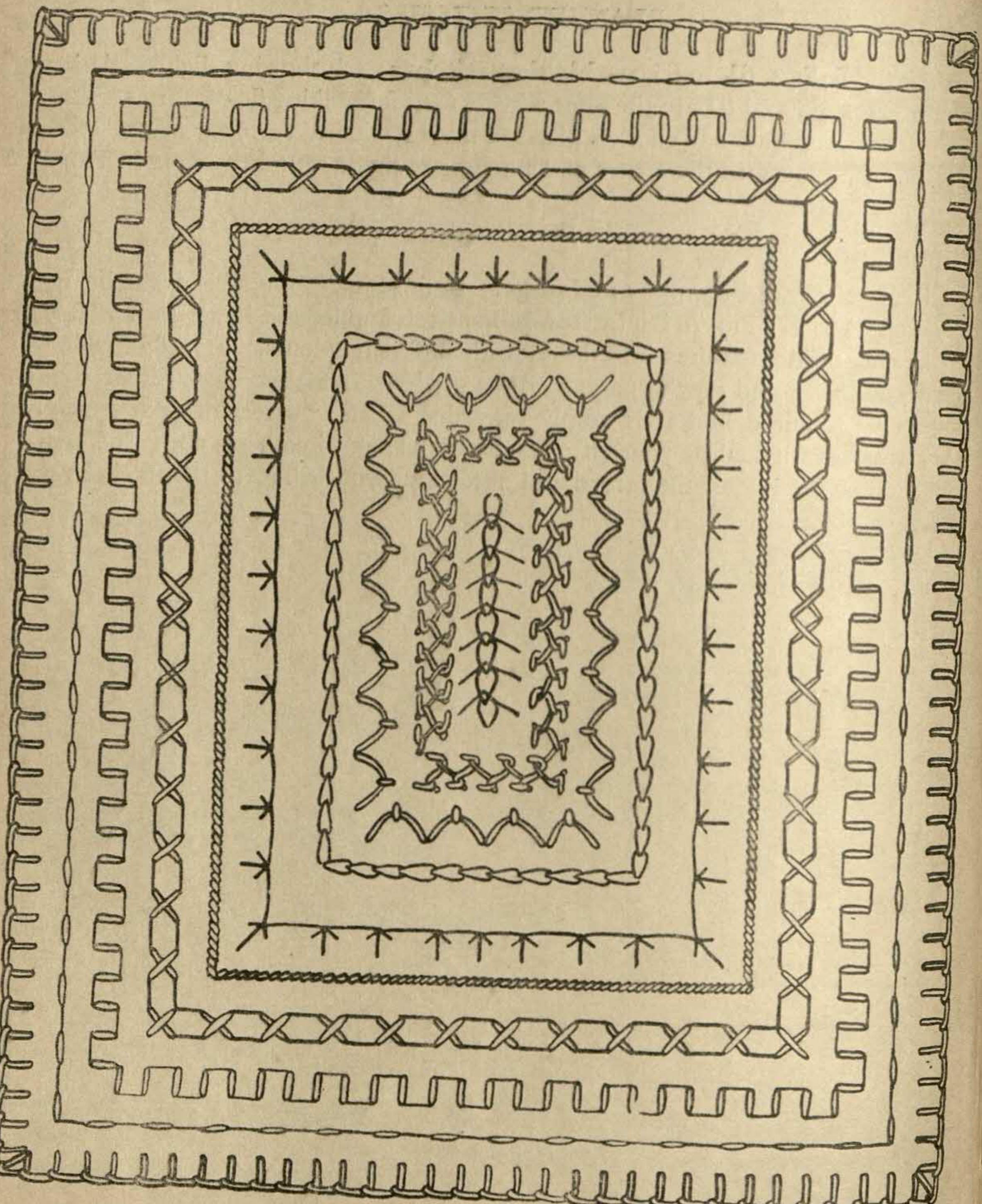


BLANKET STITCHES

In **Plate 55** Figs. **61** to **65** are **blanket stitches** each showing slight variations in form. Figs. **66** and **67** are the same stitches used for making flower forms. These stitches can also be used to encircle pieces of mirror, stitched on to garments. Pieces of mirror are placed in the centre and stitches are made round them, as in Fig. **1.**

EDGINGS

Figs. **68** to **73** are examples of **edgings.** In finishing edgings, beads can be used as in Figs. **74** to **77**. Fig. **78** is a **button-hole stitch** applied to edging. Figs. **79** to **83** are **herring-bone stitches** inter-laced with different colours. Figs. **83** to **85** are called **couching** and they are also used for borders. In making these stitches great patience is required and it is amply rewarded when you see nice patterns on your garments stitched by yourself. The names of the stitches are not very important. Follow the line of the thread and needle and you will learn the stitches very easily.



In **Plate 56** all the stitches you have so far learnt are shown in one design. By learning these stitches carefully and with patience, you can derive much enjoyment. Embroidered clothes are sold in shops at a high cost. By embroidering the articles yourself you can save much money. The first line in **Plate 56** shows the **button-hole stitch,** the second, the third and the fourth lines the **chain stitch** in various forms, the fifth line the **stem stitch;** the sixth line the **fly stitch,** the seventh line the **chain stitch,** the eighth line the **daisy stitch,** the ninth line the **herring-bone stitch** and the tenth line a combination of **fly** and **daisy stitches.**

Plate 57

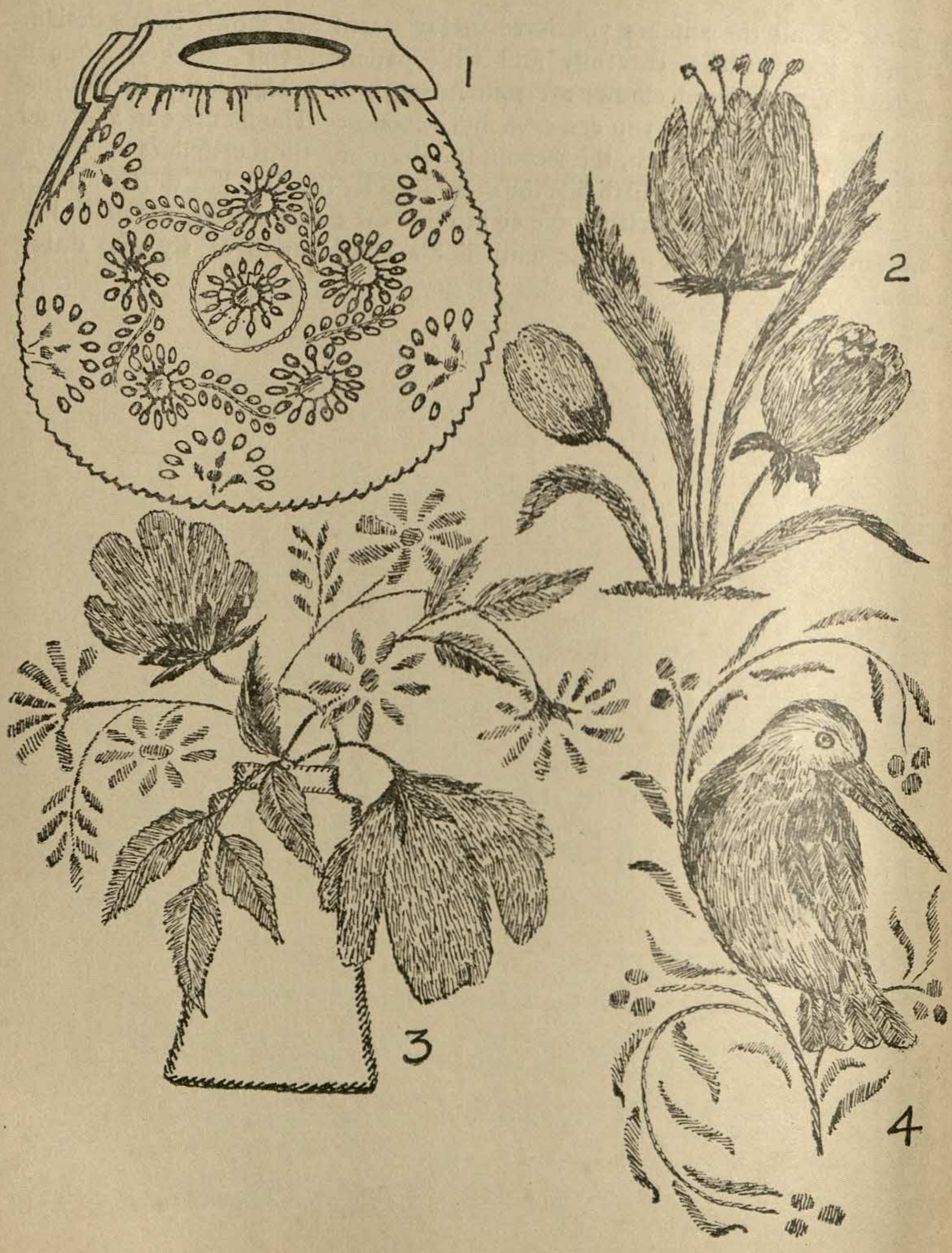
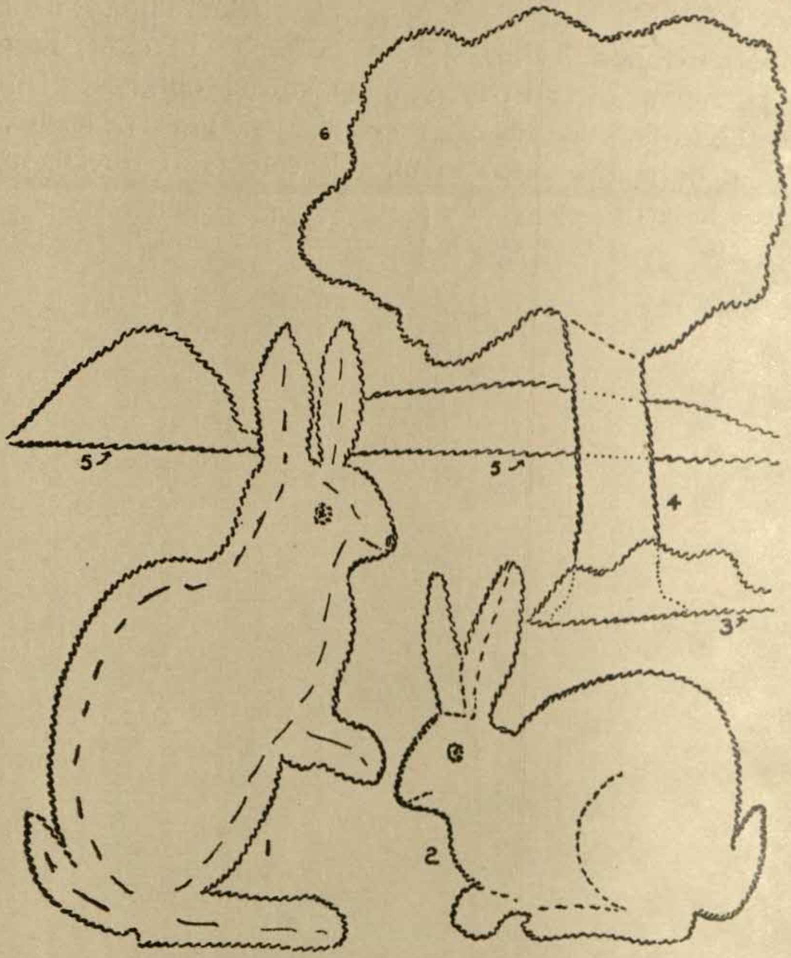


Plate 57, FIG. **1** is a bag with pieces of mirror stitched into the designs by **daisy** and **button-hole stitches.** FIGS. **2-4** are examples of close, **long** and **short stitches.** By laying the thread closely, fine texture is obtained. Different shades are also obtained by using threads of graded shades. Flowers, leaves, fruits, birds, animals, etc., can be embroidered in suitable colours of threads and they will look very realistic indeed.

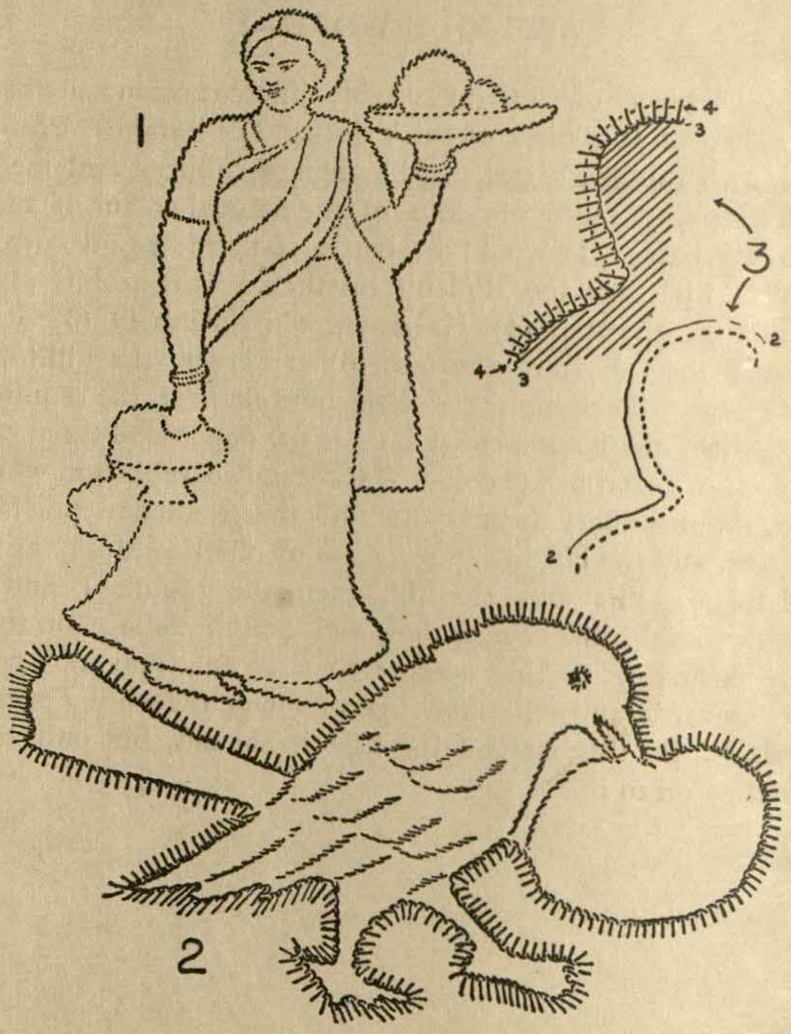
Plate 58



APPLIQUE WORK—1

In applique work pieces of cloth of suitably different colours are cut to required shapes and stitched on to a piece of thick cloth. For instance, **Plate 58** shows a landscape with two rabbits, a tree, a hill, some shrubbery and the sky. Each figure is cut in a separate piece of cloth of the natural colour of the figure and stitched on to the base. It would be better if there are no narrow pieces or intricate curves which are too difficult to stitch. The rabbits (1 and 2) are white, the trunk of the tree (4) is brown, the shrubbery (3) at the bottom of the trunk and the foliage of the tree (6) are green, the hill (5, 5) is yellow and the sky is blue. Take a piece of light blue cloth of the required size for a curtain. First, draw the landscape on a sheet of paper and trace out each part on pieces of cloth of appropriate colour. Cut the two rabbits in white, the trunk in light brown, the shrubbery at the bottom of the trunk and the foliage of the tree in light green and the hill in yellow pieces of cloth. Mark the place where each part is to go. First put the hill, then the rabbits 1 and 2, then the tree trunk with the shrubbery over that, and then the foliage on top. Fix them in position by means of tacking stitches so that they may not get dislocated. Fold the edges inwards and stitch the figures along the outlines on to the base with **stem stitch.** By this method the base is not cut, but only the appliqued figures are stitched on to it.

Plate 59 APPLIQUE WORK



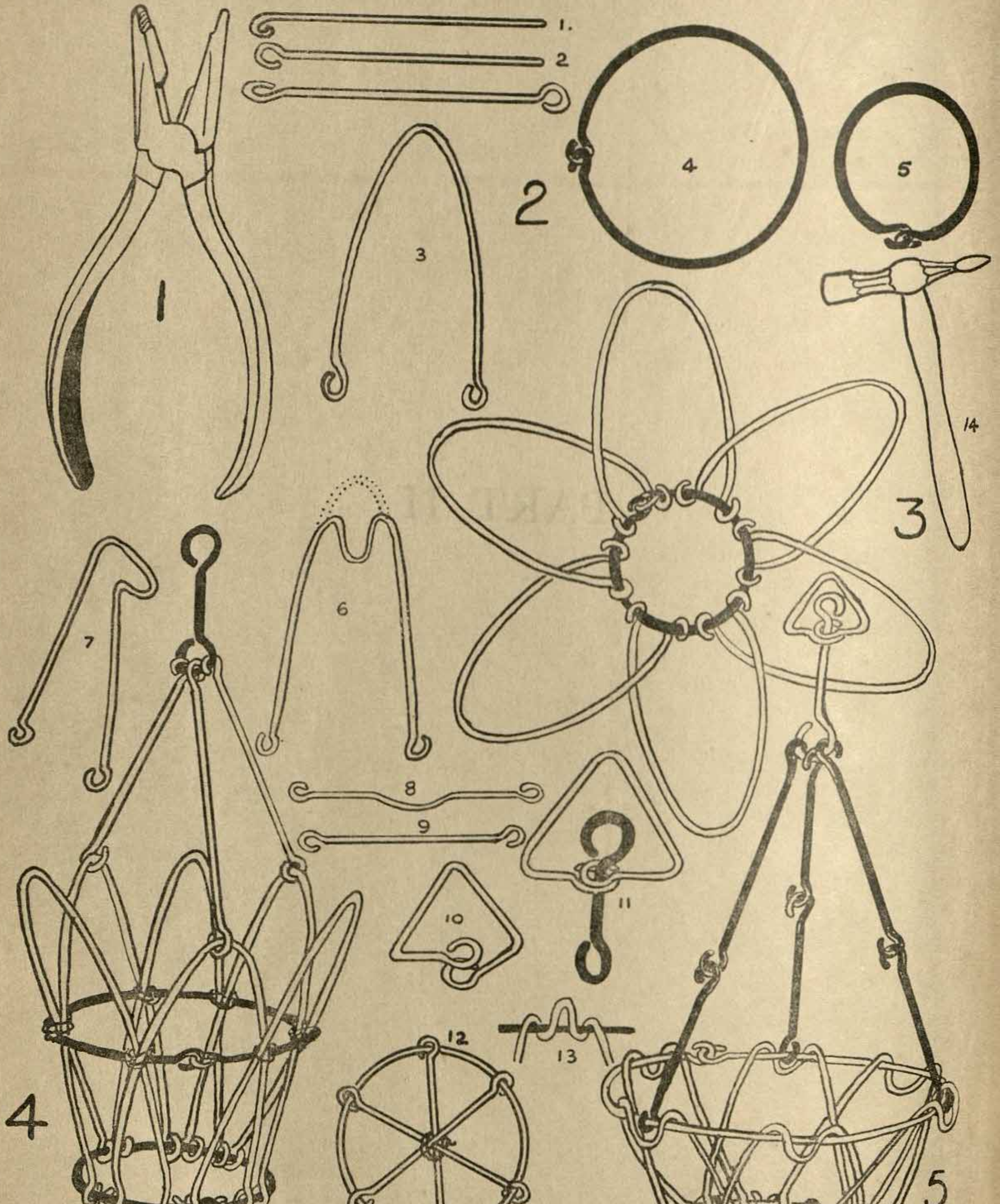
APPLIQUE WORK–2

Plate 59 shows another method of applique work. Here the base cloth also is cut according to the outline of the applique and both the pieces are stitched very carefully. FIG. **1** shows a lady going to the temple. FIG. **2** is that of a bird with a fruit in its beak. Cut the figure in a piece of cloth of the colour of the bird. Then cut off a similar shape in the base cloth. Strengthen the edge of the cutting of the base cloth by **button-hole stitches.** Put the bird in position over the figure and stitch it with **stem stitch.** FIG. **3** shows how the cutting is made. 2-2 is the outline of the figure cut from a separate piece of colour cloth. The dotted line is the actual boundary of the figure and the outer line is the extra space provided for folding in. The stitches should be made along the dotted line. 3-3 is the portion cut off from the base cloth. 4-4 is the outline along which the **button-hole stitch** or the **blanket stitch** is made. Large figures can be cut and appliqued to curtains, table cloths etc., in this way.

PART II

Plate 60

WIRE WORK



For making articles of wire, we require a round-nosed cutting plier (Fig. **1**) and a small hammer (14, Fig. **3**) for straightening the wire when necessary. The wire is available in several grades of thickness in the market. Thick wire is useful for making articles like rat-traps and letter trays. Thinner wire is useful for making bottle hangers, flower baskets etc. Very thin wire is used for binding the thicker wire.

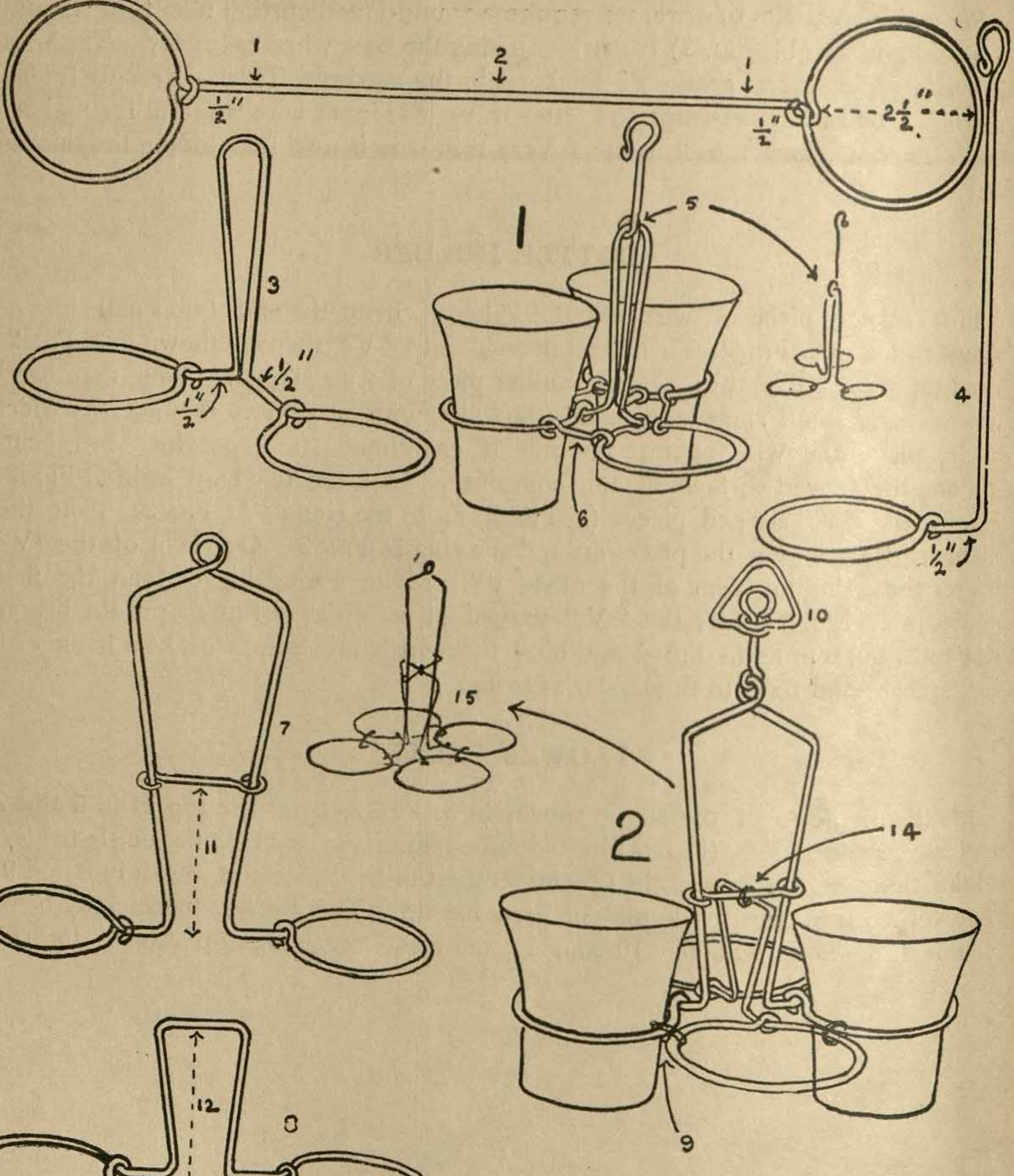
BOTTLE HOLDER

First take a piece of wire about 9½″ long. Bend the ends into small rings as shown in 1 and 2, Fig. **2**. Then bend the wire into "V" shape as shown in 3, Fig. **2**. Bend six pieces like this. Take another piece of wire about 7½″ long, then bend its ends into small rings and bend the wire into a circle. To get a perfect circle, place the wire against the side of a round tin container and bend it along the curved surface of the container. Link the two ends as in 5, Fig. **2**. Fix the six "V" shaped pieces (3, Fig. **2**) on to the ring as in Fig. **3**. Note the manner of arranging the pieces around the ring in Fig. **3**. One arm of the "V" is over the adjoining arm of the next "V". Make a ring bigger than the first one as in 4, Fig. **2**. Lift the "V" shaped pieces up as in Fig. **4**, put the bigger ring outside them as in Fig. **4** and bind them with thin wire. Make a hanger of three pieces and fix it to the holder as in Fig. **4**.

FLOWER BASKET

Make six pieces of the shape shown in 3, Fig. **2**, bend the top as in 6 and 7 and make the basket (Fig. **5**.) in the same maner as you made the bottle holder. Make the bottom frame as in 12 with straight or bent pieces as shown in 8 and 9. The top ends of the "V" may be bent like 13. The hanger pieces may be in double links as in Fig. **5**. 10 and 11 show the revolving top hanger for the basket.

Plate 61

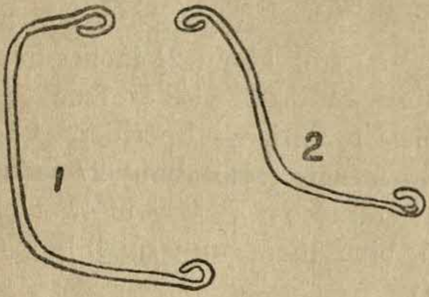


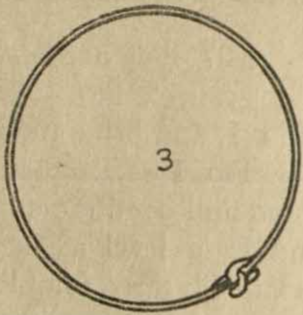
THREE-TUMBLER HOLDER

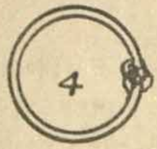
Take a piece of wire about 27″ long and make rings of about $2\frac{1}{2}$ inches to 3 inches in diameter at its ends as in 2, FIG. **1**. Then bend the wire $\frac{1}{2}$″ from the rings at both ends as in 1, FIG. **1**, and bring the rings to horizontal position as 1-1 to obtain the shape as in 3, FIG. **1**. Take another wire, also about 27 inches long. Make a ring at one end and bend the other end into a hook as in 4. Hold the three rings together and in a level as in 5, bind them with small bits of wire as in 6. This holder can hold three tumblers.

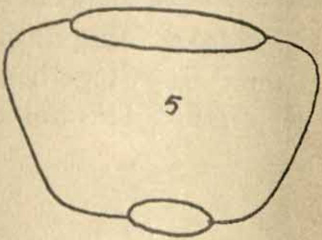
FOUR-TUMBLER HOLDER

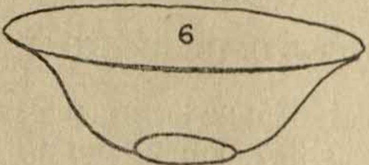
Take two pieces of wire, one about 22 inches long and the other about 28 inches long. Bend the longer one as in 7, FIG. **2**, and the shorter one as in 8. Fix a horizontal piece at 11 which is equal to 12 in height. Hold the two pairs of rings at right angles making a square of four rings as in 15. Bind the rings together as in 9 and 14. FIG. **2** shows two rings with tumblers and the other two without tumblers.











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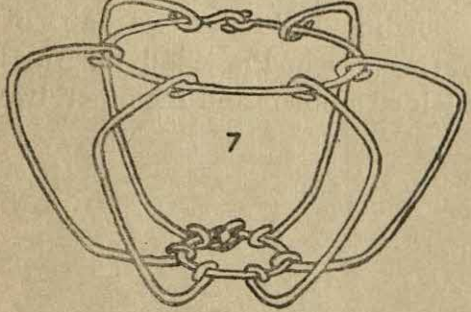

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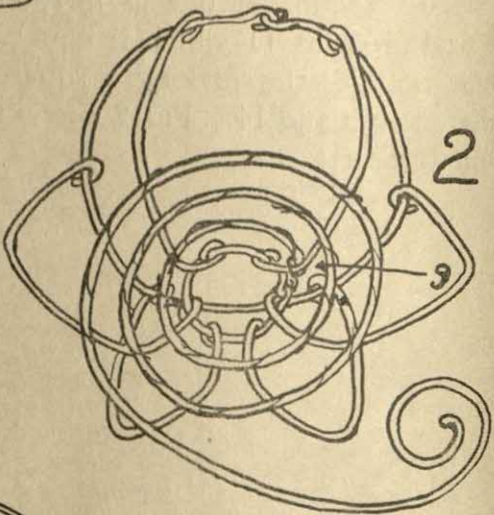

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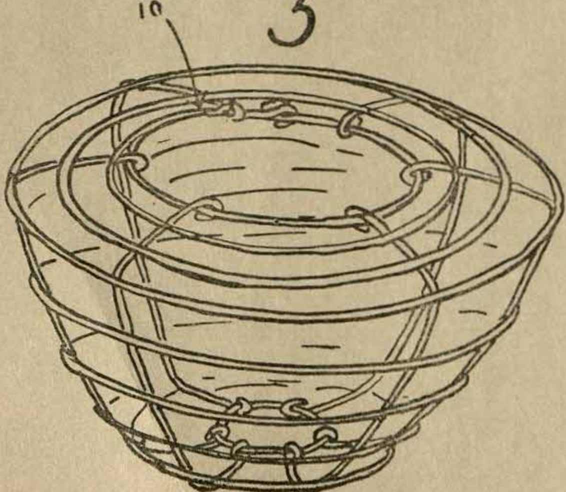

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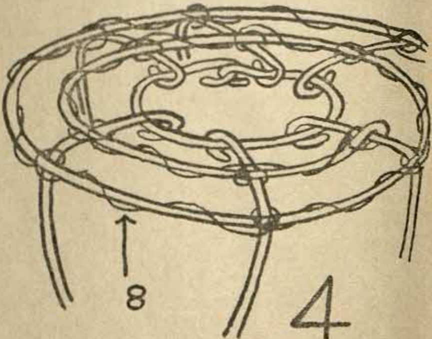
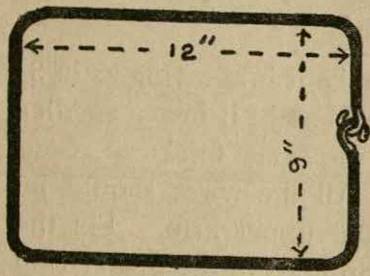


FRUIT BASKET

Take a piece of thick wire about 21 inches long and make it into a ring as in 3, Fig. **1**. Take another piece of wire about 6 inches long and make it into a smaller ring as in 4, Fig. **1**. Take six more pieces of wire of the same thickness, each 8 inches long, bend them into shape as in 1, Fig. **1**. All the wires should be bent exactly alike. The lower arm is longer than the upper arm. Fix the lower ends of these pieces to the smaller ring and the top ends to the bigger ring as in 7, Fig. **1**. You have now a frame or skeleton. Take a sufficient length of thinner wire, bend one end and fasten it to one of the six bent pieces as in 9, Fig. **2**, close to the bottom ring. Then take the remaining length of the wire round and round over all the six pieces continuously in a spiral form as in 8, Fig. **4**, till you reach the top ring as in 10, Fig. **3**. Tie the other end of the wire to one of the frame pieces near the bigger ring. While winding the thinner wire round the frame, you must go on tying it to the frame with very thin binding wire as at 8, Fig. **4**. After finishing this, fix a hanger as explained in **Plate 60.** If the skeleton pieces are bent in the manner of 1, Fig. **1**, the shape of the basket will be as in 5. If they are bent as in 2, the basket will be as in 6.



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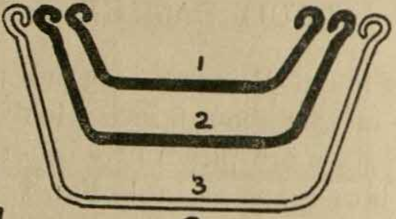

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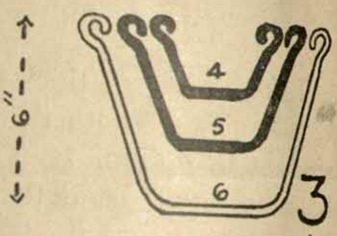

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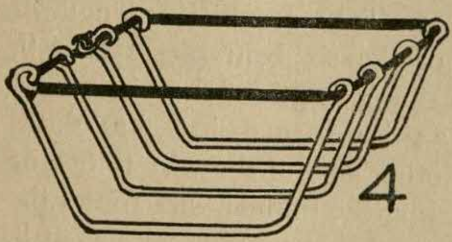

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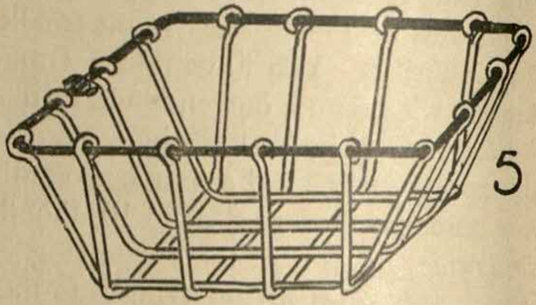

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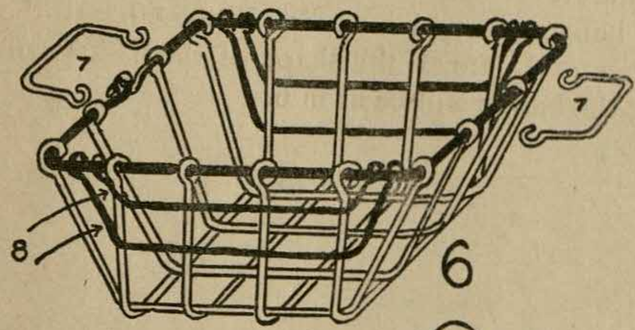

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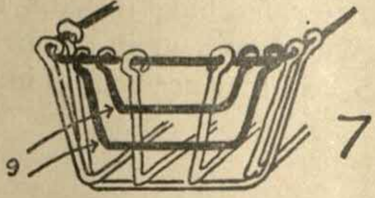

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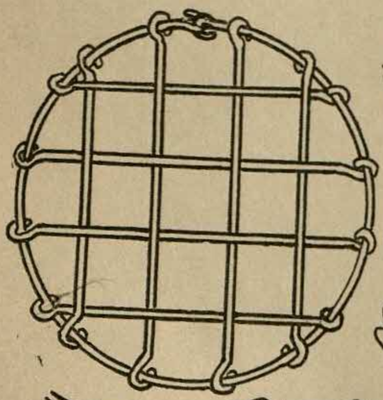

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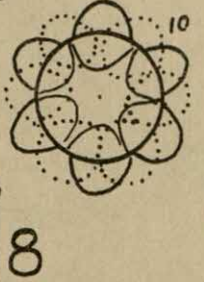

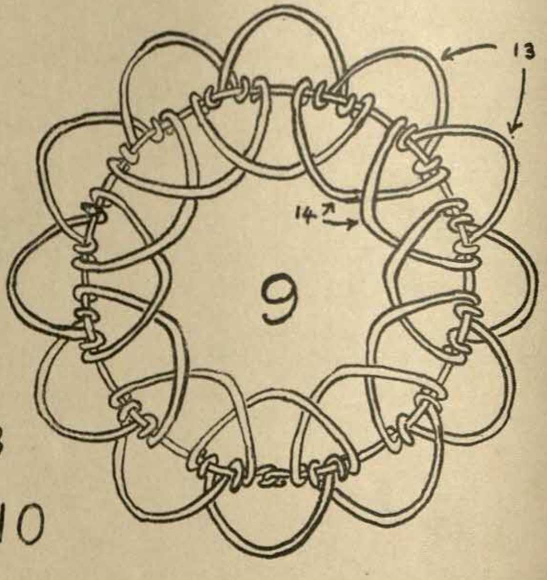

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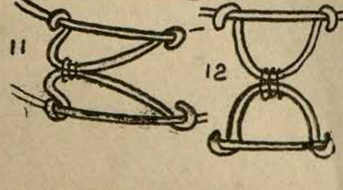
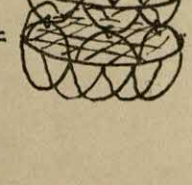




10

LETTER TRAY

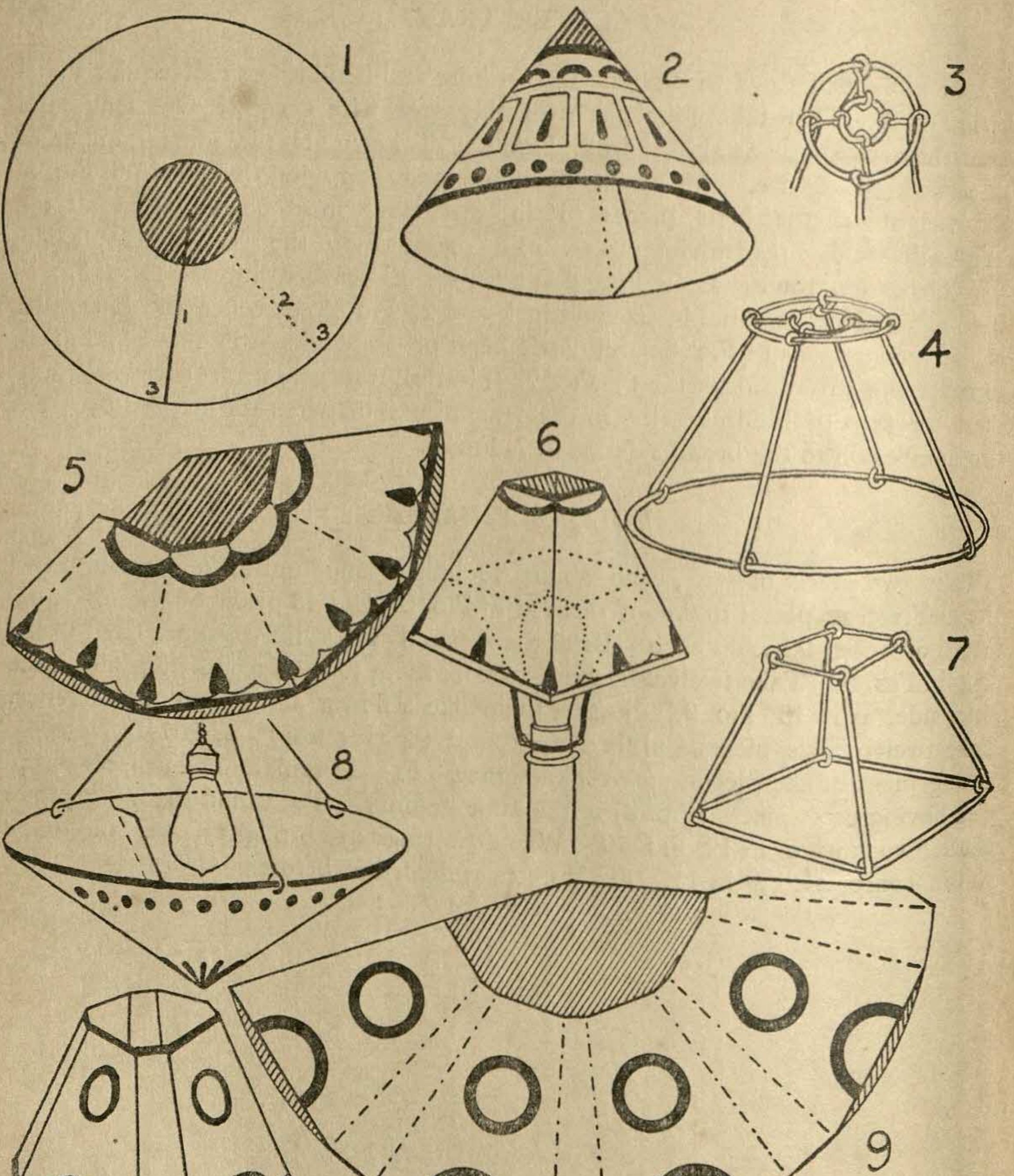
Take a piece of thick wire about 3½ feet long and bend it to a rectangular shape as in Fig. **1**. Then take four pieces of the same wire each 2¼ feet long, and bend them to shape as shown in 3, Fig. **2**. Take again the same number of the same kind of wire, each about 20 inches long, and bend them as in 6, Fig. **3**. The height of the bent pieces (6″ in this case) must be equal in all the lengthwise and breadthwise pieces. Fix them all to the rectangular frame, four pieces lengthwise as in Fig. **4**, and four pieces breadthwise as in Fig. **5**. Bend extra pieces to suitable sizes as in 1 and 2, Fig. **2**, to cover the long sides of the rectangle as in Fig. **6**. Similarly bend pieces as shown in 4 and 5, Fig. **3**, to cover the broad sides as in 9, Fig. **7**. Bind all the crossings of the long and short pieces with binding wire so that the pieces of wires are in position. Fix two handles on to the broad sides as in 7, Fig. **6**.

FOLDABLE BASKET

Take two pieces of wire, each about 30 inches long, and make them into two rings. Fix cross pieces to one of them as in Fig. **8**. Cut 48 pieces of wire of equal length of about 9 inches each. Bend them exactly alike, like the ones fixed to the ring in Fig. **9**. Take twelve of them and fix them to the second ring, all on the outer side, as in 13, Fig. **9**, adjusting them like a flower along the circumference. Take twelve more pieces and fix them round the ring inside as in 14. Note the arrangement of the pieces one over the other. Fix the remaining 24 pieces to the ring having cross-pieces (Fig. **8**) in the same manner. Then bind the outer pieces of the two rings as in 12, Fig. **10**. When the rings are brought nearer, the shape will be compressed as in 11. Fix hangers as described before.

Plate 64

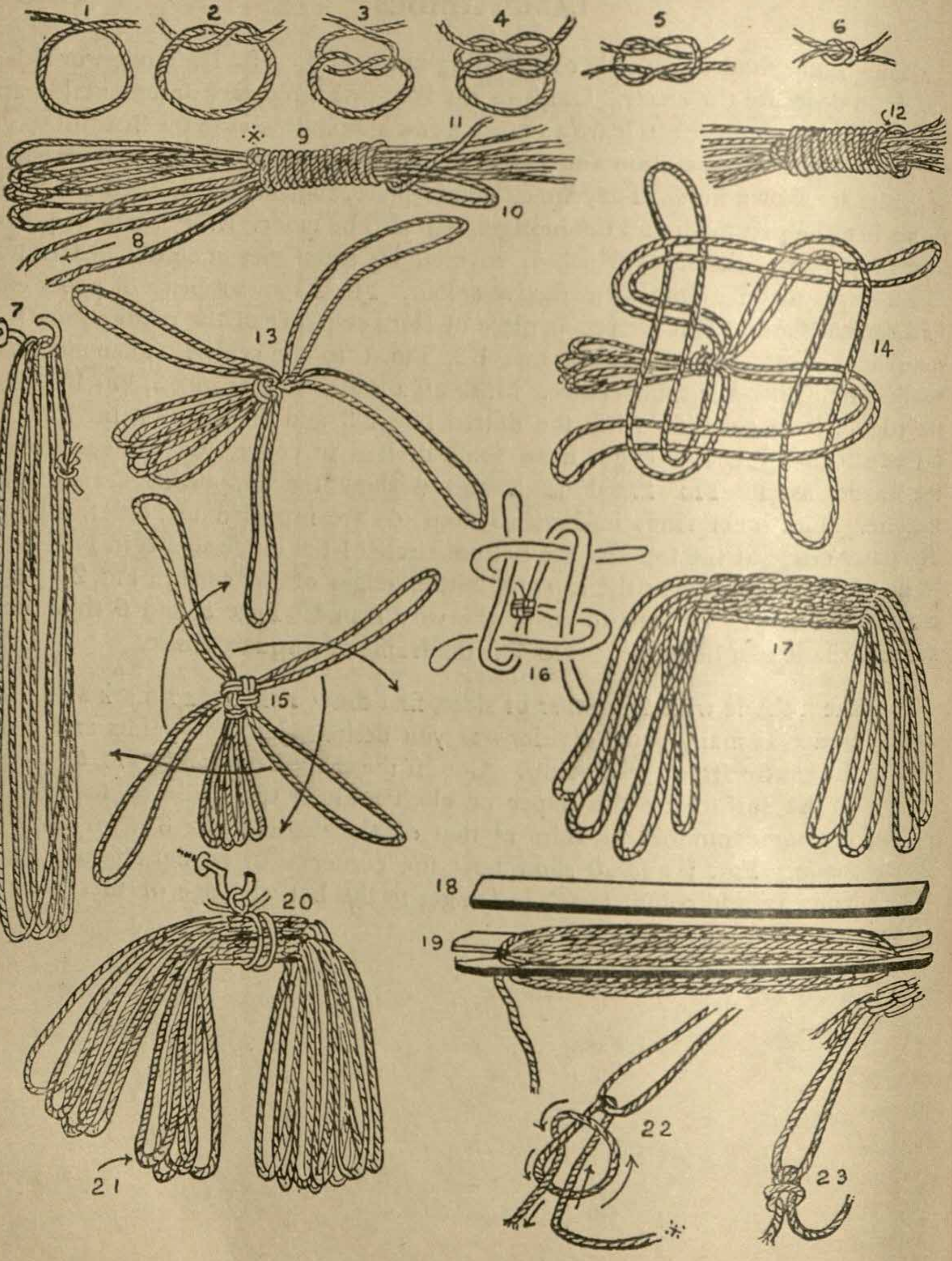
LAMP SHADES



LAMP SHADES

Making lamp shades is another interesting and useful craft. Everyone would be pleased to decorate the electric lamps in the home with pleasing ornamental lamp shades. Once you begin to learn to make a few simple shades in the first instance, you can use your imagination and design more complicated ones. Some varieties of shades are shown here. They are circular, square, conical, etc., in shape. Other shapes like the pentagon and the hexagon can also be made. Every shade requires some support or a skeleton, which is covered by some nice material like transparent paper or silk cloth of attractive colour. FIG. **1** shows a piece of paper cut for a conical shade. Cut a circular piece of cloth or paper of the required size for the shade. Cut along the dark line 1-3, FIG. **1** to the centre. Then cut off a smaller circle with the same centre. Mark off a dotted line as in 2-3, FIG **1**. Bring the edge 1-3 to coincide with the dotted line 2-3 and stick it as in FIG. **2.** Before sticking the two edges draw some designs in colours on the surface of the shade as in FIG. **2.** FIGS. **3** and **4** show the supporting frame work in wire. The inner rings in FIGS. **3** and **4** are intended to hold the bulb. The outer circle at the top and the bottom circle of the shade shown in FIG. **4** are to be of the same size as the top and bottom edges of the cone in FIG. **2.** The cone should be big enough to cover the wire frame. FIGS. **5** and **6** show how a square shade can be made. FIG. **7** is the frame of a square shade.

To make a shade with a number of sides, first draw a circle and mark along the circumference as many equal divisions as you desire. Join the points and draw lines to the centre from these points. Cut off the shaded portion in FIG. **5.** Draw designs on the surface of the paper or cloth and fix the shade on to a frame having the same number of sides as that of the shade. FIG. 8 is an inverted conical shade. FIGS. **9** and **10** show how the corners can be cut off into small sides. You can add colour tassels or fringes to the bottom edge of the shade to make it more attractive.



STRING-BAGS

Cotton string of about $\frac{1}{8}$th inch thickness can be used for making bags, but greater thickness will be required for making badminton nets, throw-ball nets and hammocks. First learn how to make a reef knot. Take two ends of a string and proceed in the manner shown in FIGS. **1** to **6.**

Handle—1

Handles are made in several ways and you can learn the method by observation. FIGS. **7** to **12** show one kind of handle.

Take a piece of string, two or three yards long and tie its ends into a reef knot. Put it on a hook in four or five loops as in FIG. **7**. Hold them all together at 3″ or 4″ from one end. Take another piece of string, fold it and hold the fold along with the original loops as in **8-9-10**. Take a third piece and wind it tightly round the bundle of loops as in **9**. Let the end of the third piece be covered by the binding string. The star-mark is the folded end of the third string. **11** is its second end. After winding over a length of about an inch, pass the end **11** through the fold **10** and draw it out by pulling at the end **8** in the direction of the arrow. This binding must be in the middle of the whole length of the loops. FIG. **12** shows this finished binding. This is one kind of handle.

Handle—2

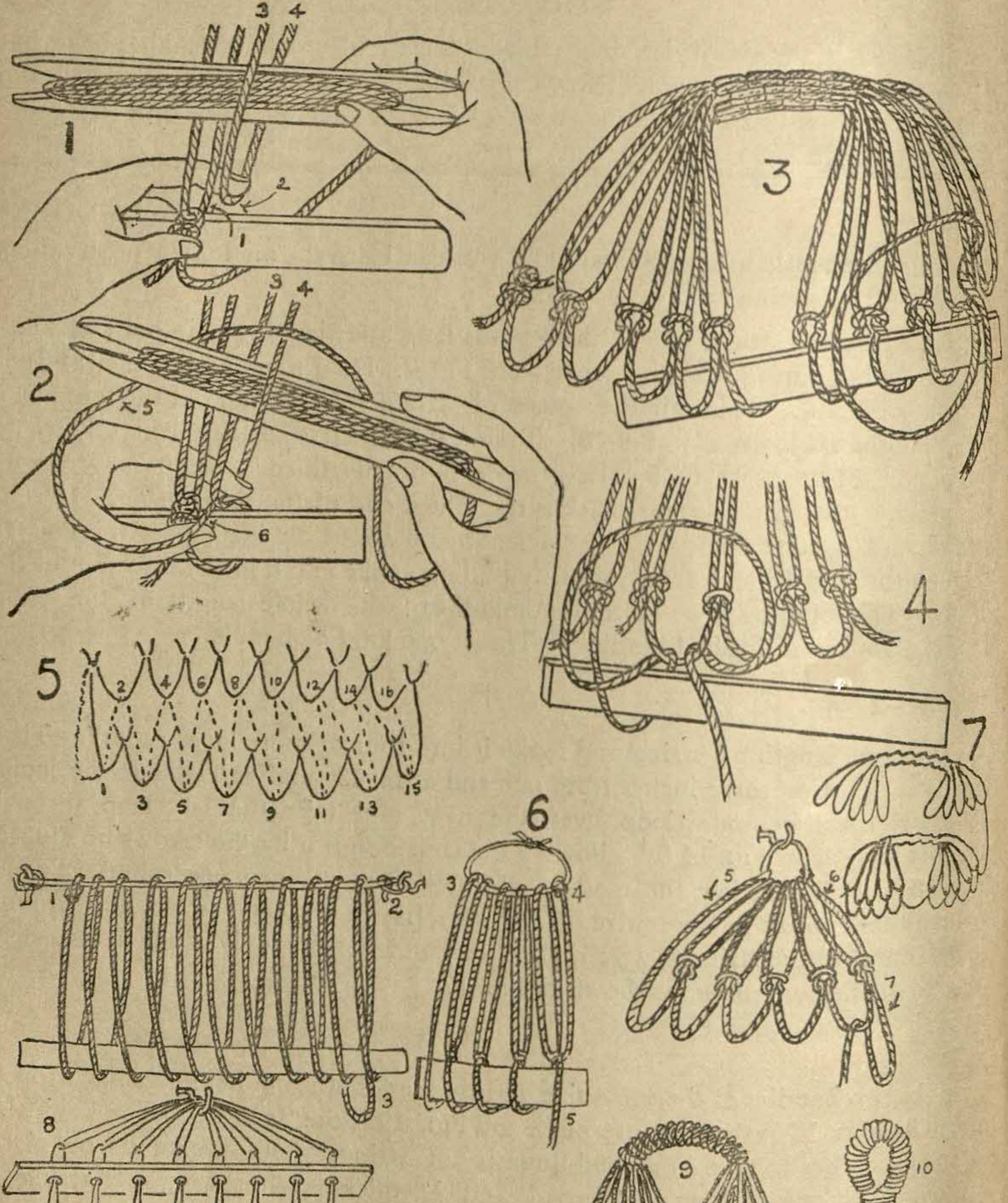
Take some length of string and make it into four or more loops as in **7**. Tie a small bit of string three inches from one end as in **13**, and spread out the loops. Put, by rotation, one loop over the next and take the last loop through the first loop as in FIG. **14** by following the course shown by the arrows in FIG. **15**. FIG. **16** explains further the method of interlacing. When one round is done, tighten the loops as in the centre of FIG. **15**. Lay the second round, third round and so on until the string is woven into the handle leaving only as much length as we had at the beginning, as shown in FIG. **17**.

Bag

Make two handles of the same size and tie them both to a hook or some support as in **20**. FIG. **18** is the measure-piece and FIG. **19** is the "shuttle". The "shuttle" has two notches to take in a good quantity of string. Both are made of pieces of wood, about 6″ long, $\frac{1}{2}$″ broad and $\frac{1}{4}$″ thick. Wind as much string as possible on the shuttle. Take one of the loops as in **21**, tie one end of the string on the shuttle to the loop as shown in FIGS. **22** and **23**. It should be in the form of a reef knot.

Plate 66

STRING WORK



Hold the measure-piece in the left hand with the first loop as in 1, FIG. **1** on the piece. Take the next loop 2 on the first finger and pass the shuttle through the loop under the measure-piece and under arm 3 of the loop. Then take the shuttle in a wide round as in 5 FIG. **2**, take it under arm 4 and over arm 3 and over 5, and draw out the shuttle. Pressing the string and the loop against the measure-piece, tighten the knot. It is a reef knot. Repeat the process with the remaining loops of this end of the handle and continue with the loops of the other end of the same handle as in FIG. **3**. As you go on doing it, the measure-piece will be covered with loops of string. Remove them to take in fresh rounds. When the loops on one handle are finished, take the nearest end of the second handle FIG. **7** and continue. Complete all the loops and make the second round as in FIG. **4**. Go on tying loops round and round till you get enough length of the bag.

Closing the Bag

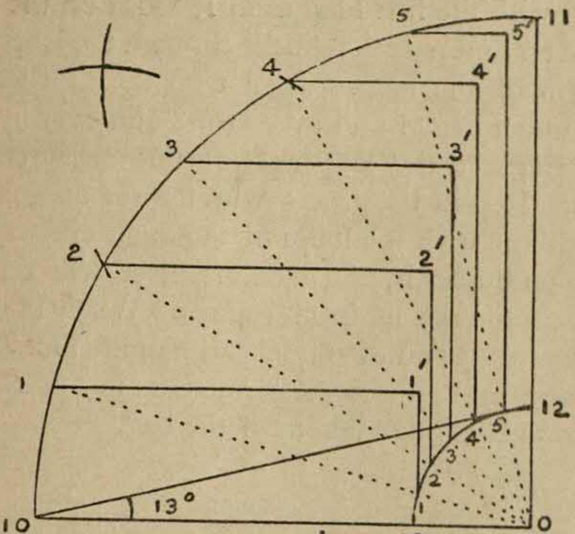
Finally when you reach one corner of the bag, instead of continuing in the same line, take one loop from the front line and one from the back line as indicated by the dotted lines in the order of the numbers 1-16 as in FIG. **5** and complete the bag.

Hammock

Tie a string between two hooks as in 1 and 2, FIG. **6**. Take a piece of wood, hold it at a distance from the string 1, 2 and wind about 10 loops round the string above and the wooden piece below. The number of loops should be in accordance with the desired width of the hammock. After laying twenty or more loops, gather them in a bundle as in 3, 4, FIG. **6**, turn the right side end to the left side and go on tying the loops as you did for the bag and as shown in 5, 6, 7. After one line is completed, change sides so that you begin always a fresh line from the left.

Make about five feet length of hammock. The measure-piece may be broader as the holes need not be as small as those in the bag. Take a piece of wood, make as many holes in it as there are loops in the hammock. Take the loops through the holes as in **8**, pass separate strings through these loops and over a hook. Tie this bunch with extra string as in 9, just as you did in making the handle as shown in FIG. **9, Plate 65**. Finish the other end of the hammock as in 10, in the same manner. The hammock may be tied to two supports.

SUN-DIAL



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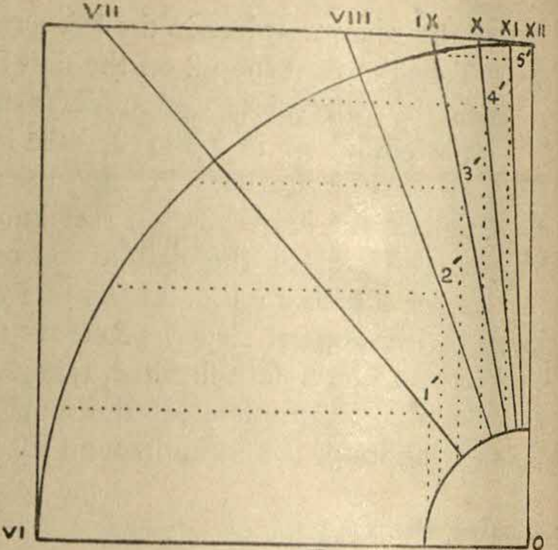

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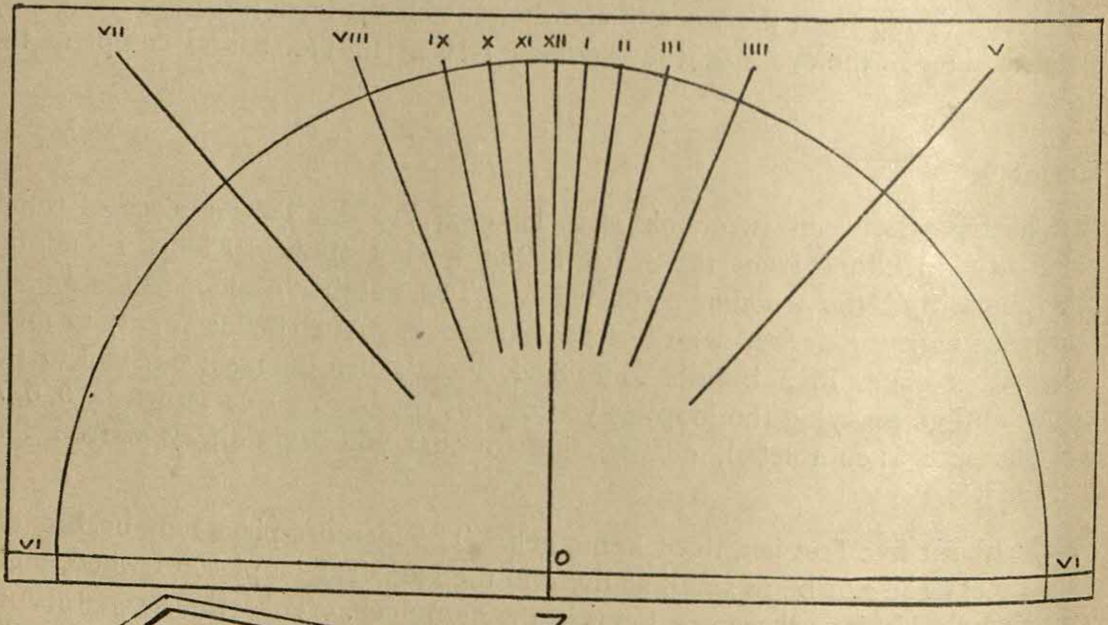

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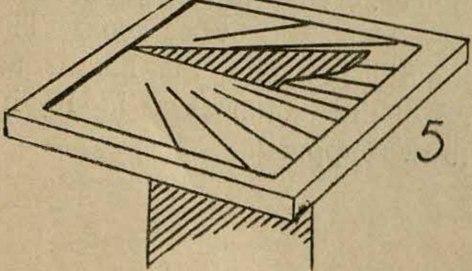

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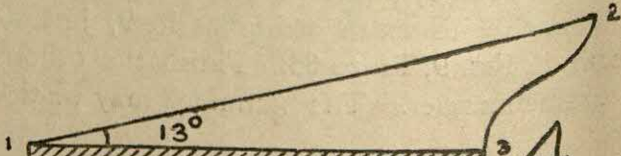


4

HORIZONTAL TYPE

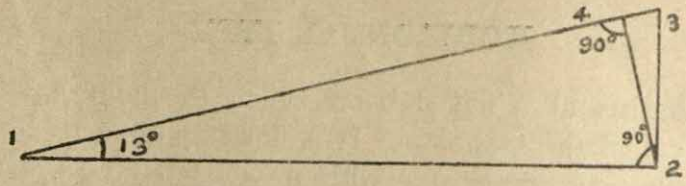
The sun-dial consists of a flat slab on which the hours are marked with a shadow-indicator called the Gnomon. It is not easy to make a sun-dial with a marble slab. So we can make one with a wooden board. In marking the hours you must take into consideration the latitude of the place where the sun-dial is to be used. The sun-dial explained here is for the places whose latitude is 13°

On a sheet of paper draw a quadrant or quarter circle 0-10-11, FIG. **1**. Draw a line 10-12 making an angle 0-10-12 of 13°. With 0 as centre and 0-12 as radius draw another quadrant 0-12-13. Divide the outer quadrant 10-11 into six equal parts. This can be done very easily. Mark the radius 0-11 on the arc from 11 to 2 and from 10 to 4. There are three equal divisions 10-2, 2-4 and 4-11. Bisect each of them and mark numbers 1 to 5. Join these points to the centre 0. While doing so you will be marking points 1 to 5 in the smaller quadrant also. Draw vertical lines from the points 1 to 5 of the smaller quadrant and horizonal lines from 1 to 5 of the bigger quadrant. These lines meet at points 1′, 2′, 3′, 4′ and 5′. In FIG. **2** these points are clearly marked. Draw lines from 0 to the outer arc through these points to meet the line VII to XI. These are the lines of shadows at their respective hours. FIG. **2** shows one half of the dial and the same has to be copied on the right side. FIG. **3** is the full diagram. Copy or transfer this to the wooden board of the sun-dial, as shown in FIG. **5**.

Gnomon

Cut a piece of tin as shown in FIG. **4** with an angle of 13° as 2-1-3 and fix it along the line 0-XII as in FIG. **3**, with 1-3 as the base and 2 pointing to the north. As the gnomon must be thin, a tin piece will be suitable for the purpose.

SUN-DIAL


4
3
90°
1
13°
90°
2

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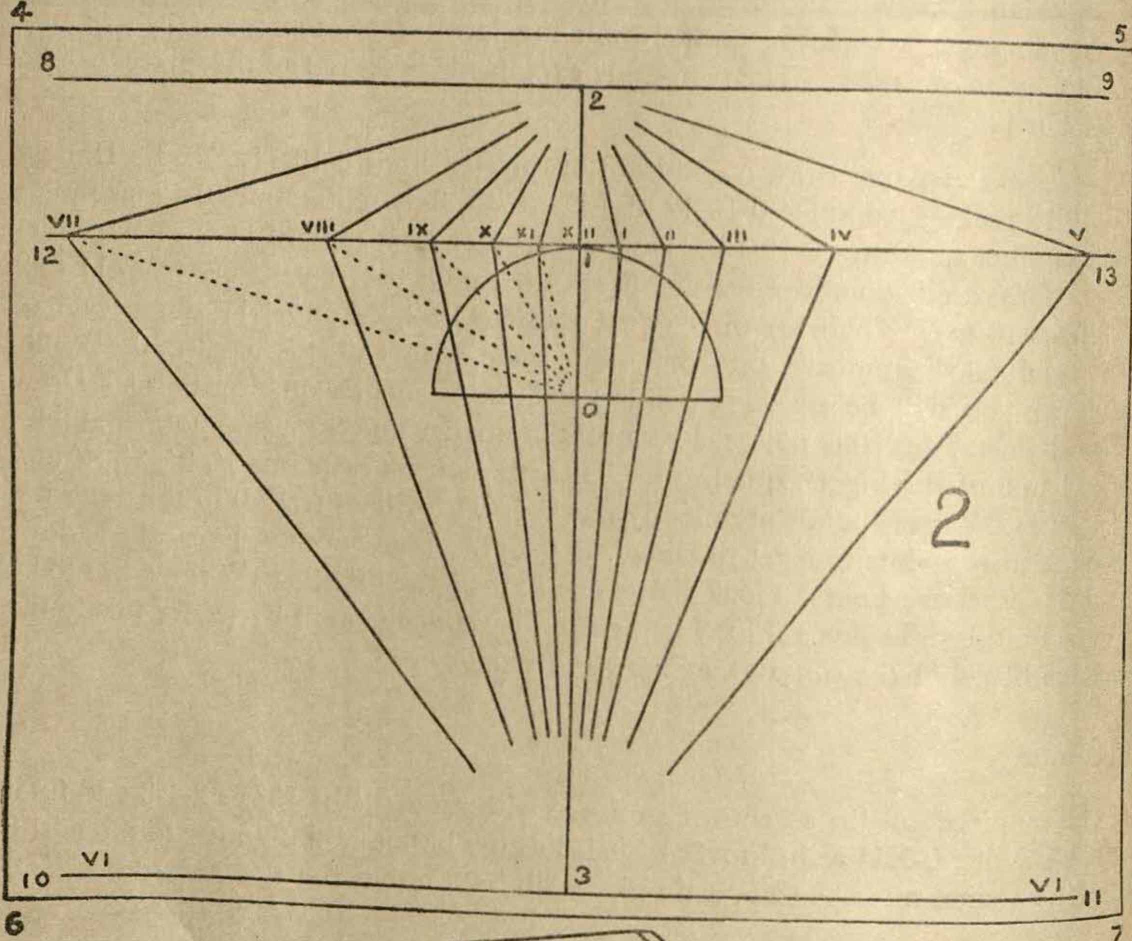
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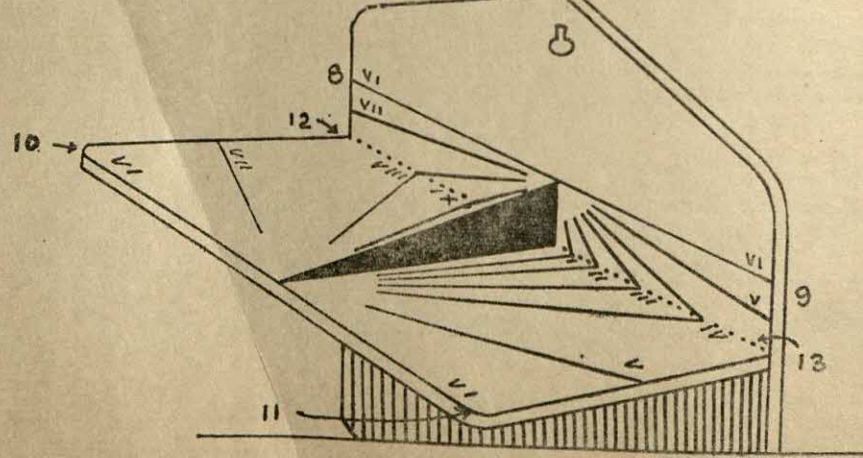
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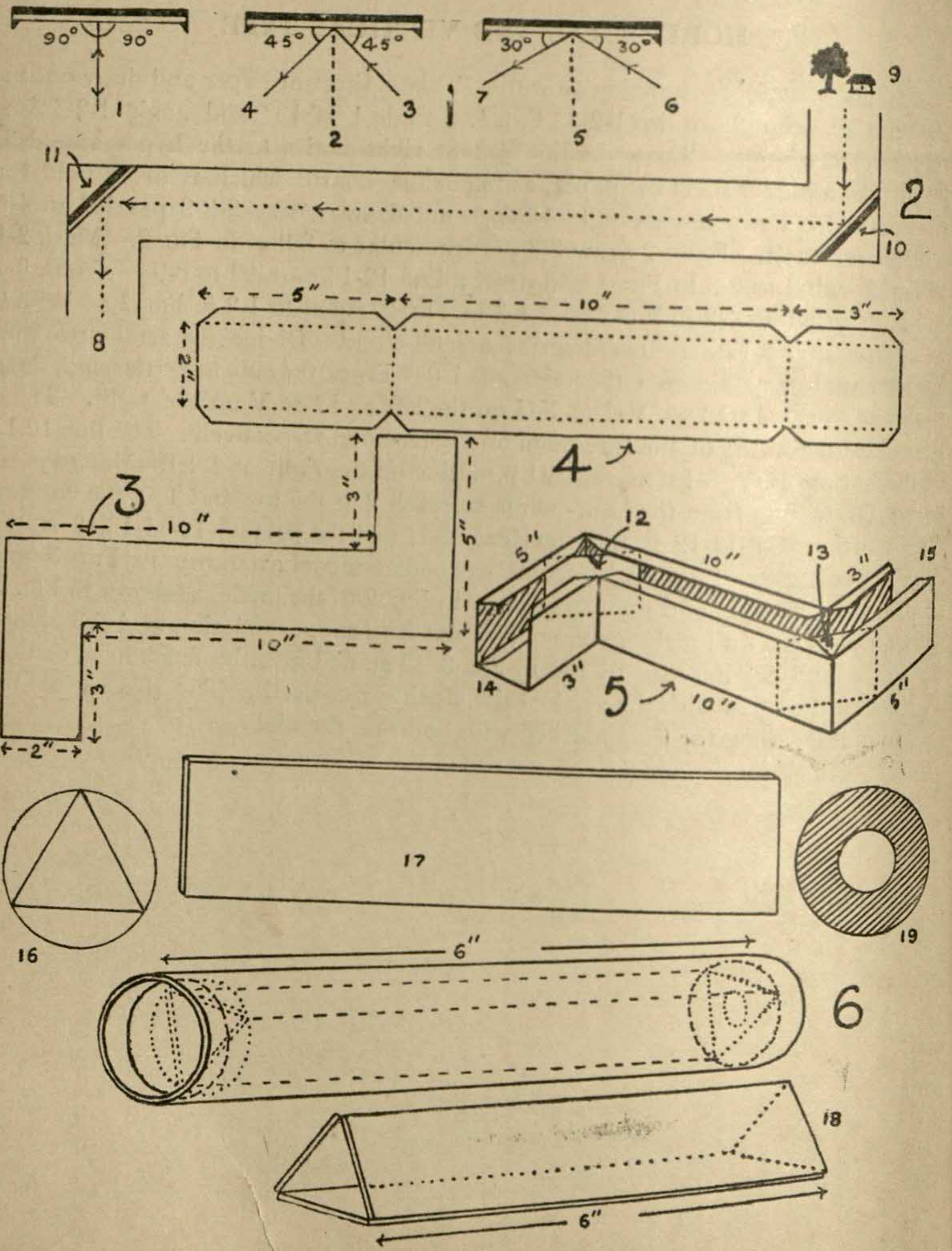
3

HORIZONTAL AND VERTICAL TYPE

This type is useful for hanging on walls. Take a sheet of paper and draw on it a right-angled triangle as in 1-2-3, FIG. **1**. Angle 1 is 13° and angle 1-2-3 is a right-angled triangle. Draw the line 4-2 at right-angles to the hypotenuse 1-3. Then take a bigger sheet of paper, as big as the board, which is to be used for the sun-dial. Draw a rectangle 4-5-7-6 and draw a line 8-2-9 parallel to 4-5 and nearer to it. From 2 draw 2-3 perpendicular to 8-9 as in FIG. **2**. Mark 2-1 in FIG. **2**, equal to 2-3 in FIG. **1** and draw a line 12-13 parallel to 8-9. Mark 0-1 in FIG. **2** equal to 4-2 in FIG. **1** and 1-3 in FIG. **2** equal to 1-2 in FIG. **1**. With 0 as centre and 0-1 as radius describe a semi-circle. Divide the semi-circle into twelve equal parts, six on either side of 1-0. From 0 draw lines through these points to reach 12-13 at VII to XII on the left and I to V on the right. These points are the hours of the fore-noon and after-noon respectively. The line 10-11 at the bottom is the VI a.m. and VI p.m. line on the right and left sides respectively. Draw lines from the hour-points to reach 2 at the top and 3 at the bottom. The portion 8-9-13-12 is the **vertical** part and the portion 10-11-13-12 is the **horizontal** part of the dial. Make a wooden model as shown in FIG. **3** and transfer all the lines and numbers shown in FIG. **2** to the model as shown in FIG. **3**. Take a piece of tin for the gnomon and cut it to shape and size as 1-2-3 shown in FIG. **1** and fix it to the dial as in FIG. **3**. The dial must be fixed to a vertical surface in the open with the vertical side facing due north. The shadow of the gnomon falls along the lines marked with hours on the dial.

Plate 69 PERISCOPE—KALEIDOSCOPE



PERISCOPE OR VIEW FINDER

If you hold a mirror exactly in front of you, you can see your own image in it. The rays emanating from you reach the mirror perpendicularly and come back reflected to you as in 1, FIG. **1** and so you are able to see your image. If you turn the mirror to a side, so that the rays reach the mirror at an angle of 45°, you cannot see your image, but you can see the image of any object nearby. At 2 FIG. **1**, 3 is the ray from the object to the mirror and it is called the **Incident ray** and 4 is the **Reflected ray.** They make equal angles of 45° with the central line 2 which is called the **Normal.** At 5, FIG. **1** the **Incident ray** 6 makes an angle of 30° with the mirror and an angle of 60° with the **Normal** 5. 7 is the **Reflected ray** making similar angles with the mirror and the **Normal.** On this principle a person at 8, FIG. **2** can see the tree and the house 9 which are hidden from the actual view of the person. The mirror at 10, FIG. **2** which is placed at an angle of 45° throws the reflected ray to the left on to the mirror 11 which is also placed at an angle of 45° transmitting the reflected ray to 8, where the person stands.

To make this model, take a piece of card-board and cut two pieces of the same size and shape shown in FIG. **3**. Cut two more pieces as shown in FIG. **4**. Then stick the two pieces cut as in FIG. **4** along the borders of the piece in FIG. 3 to obtain the shape as shown in FIG. **5.** Fix the mirrors in position as in 12 and 13 at 45°. Finally close the model with the remaining piece cut as per FIG. **3.** If you now look through the periscope from 14, you can see the object at 15.

KALEIDOSCOPE

The kaleidoscope is a very amusing toy and it is easy to make one. It is a card-board tube fitted with three long pieces of glass, three pieces of round glass and some bits of glass of different colours. By turning round the tube, you will see ever-changing varieties of designs inside it caused by the reflection of the coloured glass bits.

Describe a circle about 1½ inches in diameter and draw an equilateral triangle inside it as in 16, Fig. **6**. Take three pieces of glass each about 6 inches long with its breadth equal to the side of the triangle as in 17, Fig. **6**. Make a tube of card-board about 7 inches long with the same diameter as that of the circle, viz., 1½″. Take also three circular pieces of glass which can be fitted into the tube. Make one of the circular pieces opaque by sticking a piece of white tissue paper on it. On another piece, stick a circular bit of paper with a round hole, as in 19, Fig. **6**. Leave the third piece of glass entirely transparent. Fix this piece of round glass in the tube about half an inch from one end and secure it in position with small bits of paper plaster. Put some broken pieces of coloured glass and beads over the circular piece of glass just fixed. Then fix the opaque piece of round glass with the broken bits of glass and beads lying between it and the inner piece and secure it in position as before. The space between these pieces should be sufficient to allow of free movement of the broken pieces of coloured glass and beads. Take the three rectangular pieces of glass, arrange them as a triangular prism as in 18, Fig. **6** and insert the prism into the tube through the other end. See that the prism stands in the centre by sticking bits of plaster in a few places. Then take the third circular piece of glass with the transparent hole in the centre, fix it over the prism at the other end of the tube and secure it in position. Paste some coloured paper over the tube to make it attractive. If you rotate the tube, the coloured bits change their position constantly and are reflected over all the sides of the prism presenting beautiful star-like patterns of colour.

BABY'S SWING

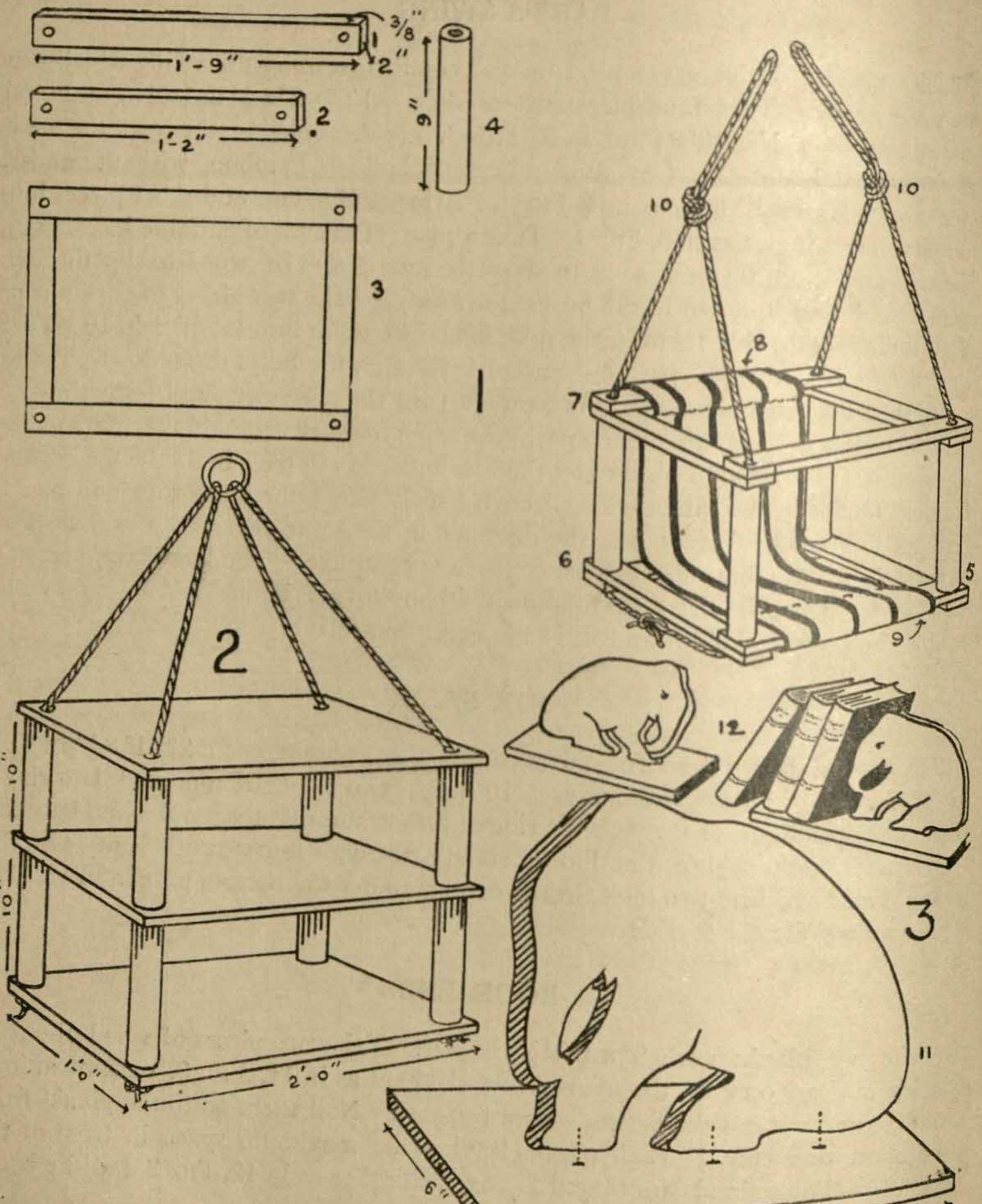
Babies usually derive great pleasure and comfort in using this swing which you can make easily. Take four pieces of wood each 1′9″×2″×$\frac{3}{8}$″ as in 1, FIG. **1** and four pieces each 1′2″×2″×$\frac{3}{8}$″ as in 2, FIG. **1.** Make holes in them at the ends as shown in 1 and 2. Cut four pieces of hollow bamboo without nodes, each about 8″ or 9″ long as in 4, FIG. **1.** Arrange the long and short pieces into two sets of rectangles as in 3, FIG. **1.** Take a piece of canvas of suitable length, say, 1$\frac{1}{4}$ yards and stitch the ends so as to allow the long pieces of wood to slip through them as in 8 and 9 shown in the finished drawing. Take two pieces of cotton rope of suitable length, fold them in the middle and tie them into knots as in 10. Take one piece of the rope, pass one end of it through the holes in the long piece of wood, then the short piece, then the bamboo, then the long piece and lastly through the short piece. Pass the other end in the same manner through the holes at the other end of the wooden pieces and then tie both ends into a knot under the bottom frame. Then slip the canvas over pieces 5 and 7. Take the other rope and pass it through the wooden pieces and the bamboo in the same order as the first rope and tie it at the bottom. The swing is now complete. The long loose piece of wood in front can be lifted up to allow the baby to get in and then let down to enable the baby to hold it and sit in the swing comfortably.

BOOK SHELF

The materials required for the shelf are three planks, each 2′×1″×$\frac{1}{2}$″ in size, eight pieces of hollow bamboo, each 10″ long, two pieces of rope and two rings. Pass the ropes in order through the ring and then through the planks and bamboo pieces alternately as shown in FIG. **2**, and tie the ends into a single knot as in the swing, FIG. **1**, or into two knots in the corners under the bottom plank. You may use two rings for the two sides.

BOOK ENDS

Take two planks each 9″× 6″×$\frac{1}{2}$″ in size. Take two pieces of wood about $\frac{1}{2}$″ thick and draw on each the figure of an elephant as in 11, FIG. **3**, or any animal you like and cut out the figures with a fret-saw. Nail them on to the planks from under, at one end on each plank, leaving the maximum space in front of the animals. The animals are placed facing each other as in 12, FIG. **3** and the books are placed between them.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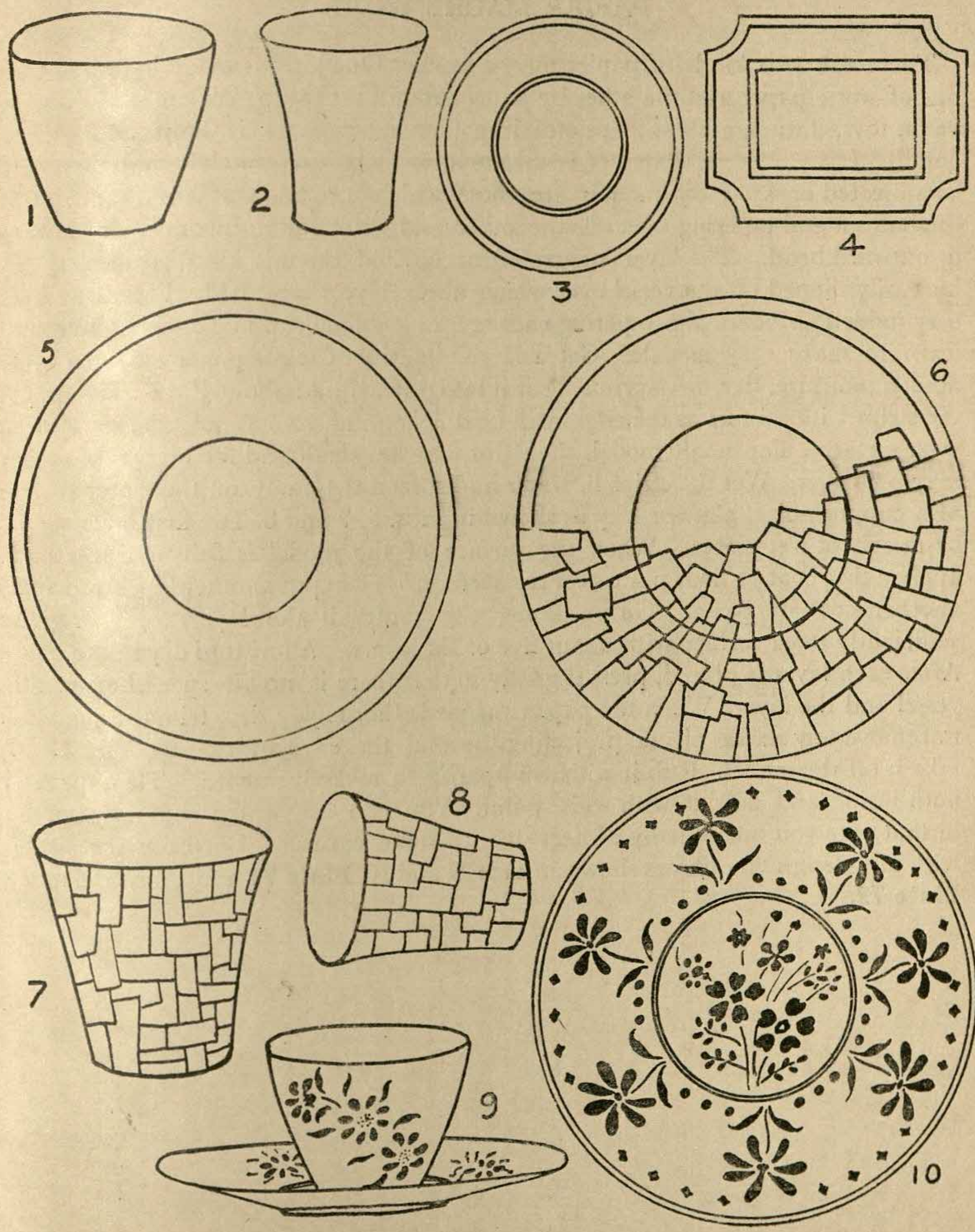
11
6"
9"
1/2"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PAPIER MACHE WORK

There are two kinds of papier mache work. One kind is made by using torn bits of waste paper and the other by paper ground into pulp. We can make vessels, vases, toys, statues, globes, maps etc. in papier mache. It is light and can be handled easily. Some shapes of vessels tend to make easy models and some are complicated ones. Easy models are those which are wide at the mouth or at the bottom and tapering towards the other end without any inconvenient inward or outward bend. The layers of papier mache laid on this kind of models can be easily slipped off the vessel over which these layers are laid. FIGS. **1** to **4** are easy models. Models with tapering ends are a bit difficult to make. First you must learn to make easy models. Get a large quantity of waste paper that can easily absorb moisture, like news-print. Tear it into tiny strips of about $\frac{1}{4}'' \times 2''$. Do not cut the strips with scissors as the edges will be thicker and so cannot merge into an even surface. For small models the strips may be small and for bigger ones they may be bigger. Wet the strips in water and spread them out on the outer surface of a cup, tumbler, plate or tray as shown in FIGS. **6**, **7** and **8**. The first layer should be merely of wet pieces. When the surface of the model is fully covered once, apply a thin coat of flour paste over the surface. Then put another layer and apply another coat of paste. Go on doing this until all the layers together give a sufficiently thick surface with about five or six layers. Allow it to dry in the shade. After each layer is placed, press it gently so that there is no air space between the vessel and the layer. When the papier mache is thoroughly dry, trim the edge so as to remove any extra pieces projecting beyond the edge of the model. Gently take it off the model. Rub it with sand-paper to make it smooth. Then paint it both inside and outside with white paint. You can use water colours also, but in that case you must finally protect it with some varnish. Decorate the surface with any design you like as shown in FIGS. **9** and **10**, **Plate 71** and FIGS. **3**, **4** and **5**, **Plate 72.**

When the model has a bulge or depression in its body, bigger or smaller than the top or bottom as in Figs. **3**, **4** and **5**, **Plate 72,** proceed as follows: First spread the bottom layer of wet pieces without paste. Then mark the middle line as indicated by the broken line in Fig. **1** and lay strips dipped in thin paste on the surface leaving some portion on either side of the central line. This portion may have some strips without any paste projecting into the opposite half. When enough number of layers are pasted let them dry as before. Then carefully take off the two halves from the model. They will come off easily because there are no pasted strips in the middle. Then bring the halves together, interweave the projecting strips, applying paste over every layer and let it dry. The model is now complete. You can finish it as before and decorate it.

The Globe

Fig. **8**: Take a football bladder or a balloon, inflate it fully and tie its mouth. Cover it all over first with wet strips of newspaper and then with paper strips dipped in paste as in Fig. **6**. Put up layer after layer till you get a good thickness of crust. Let it dry. Then release the air completely and carefully draw out the bladder through the hole. Cover the hole with pasted paper strips. Cut two small circles of tin, Fig. **7**, hammer them into a slightly concave shape, make holes in the centre and fix them at the top and bottom of the globe as in Fig. **7**. The tin pieces should be imbedded on the globe by paper strips covering the tin and the surrounding surface, leaving the central holes as in 2, Fig. **7**. Before fixing the tin pieces, take care that the North and South Poles are marked.

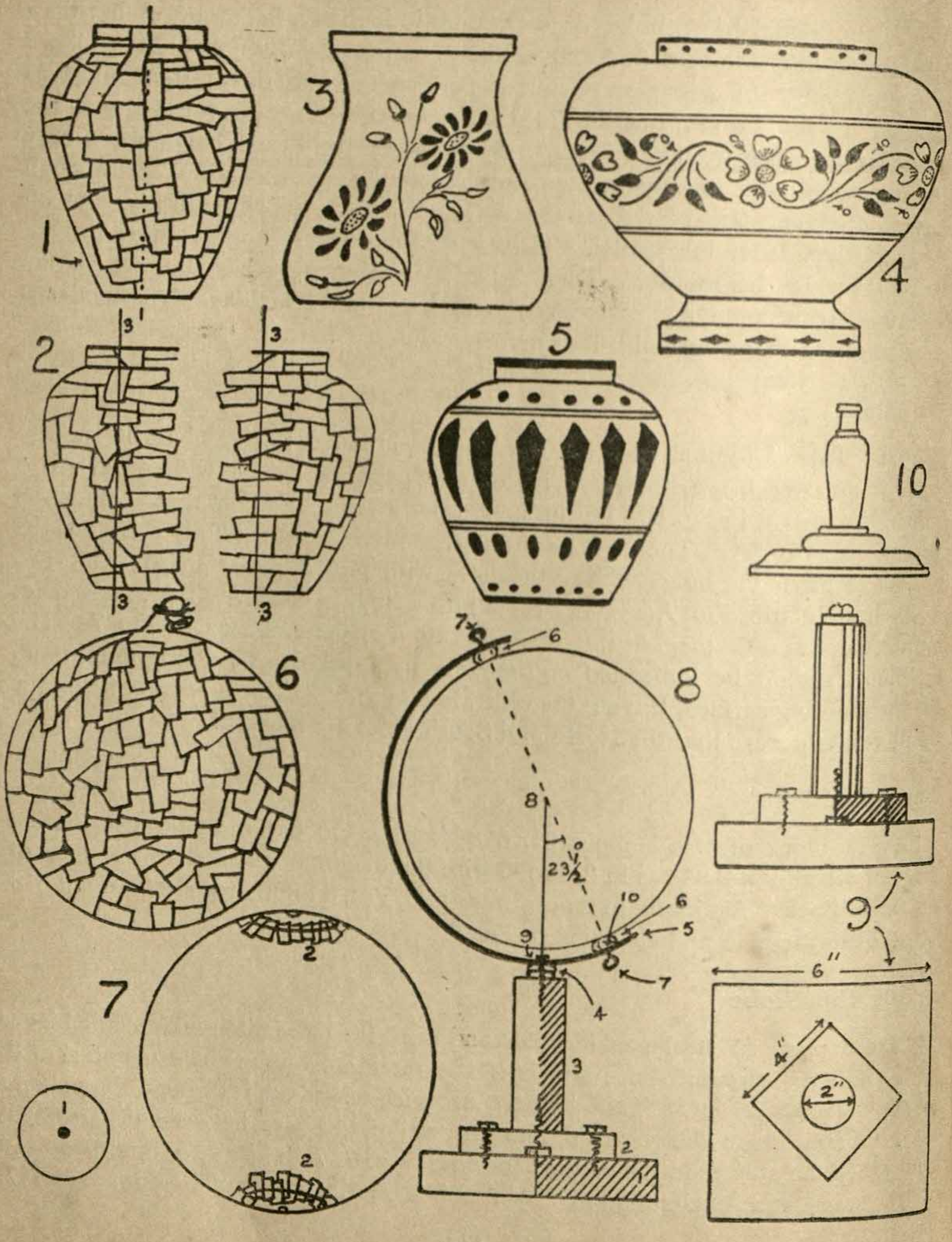
The Stand

Take a block of wood about 6″×6″×¾″ as in Fig. **8**, fix in its centre another piece of wood 4″×4″×¾″ as in 2, Fig. **8** with the diagonals parallel to the sides of the first block. Again fix in its centre as in 3, Fig. **8** another piece of wood 6″×2″×2″ as in the plan and elevation in Fig. **9**.

Fixing the Globe

Take a piece of steel packing belt and bend it to a semi-circular shape bigger than half the circumference which is the meridian of the globe as in 5, Fig. **8**. Make holes at its ends. Take a piece of thick wire, pass it through the poles to form the axis. Fix glass beads 6, 6 to the ends of the wire between the steel belt and the globe and bend the ends of the wire as in 7, 7. The globe should be fixed on the stand at an inclination of 23½° which is obtained as explained on page 147.

Plate 72 PAPIER MACHE WORK



Draw a circle on a sheet of paper equal to the circumference of the globe. Mark the poles. Place the bent steel belt concentric to the semi-circle from pole to pole and trace a line along the belt. Draw a line 8, 9 at an angle of $23\frac{1}{2}$° from the centre reaching the line of belt at 9. 10 is the hole in the belt through which the axis passes. Mark this distance 9 to 10 on the belt. Make a hole in the belt at 9 and fix it to the stand by a screw. This belt should be fixed before the globe is fixed to it. The stand may be also of turned wood as in FIG. **10**.

Relief Maps

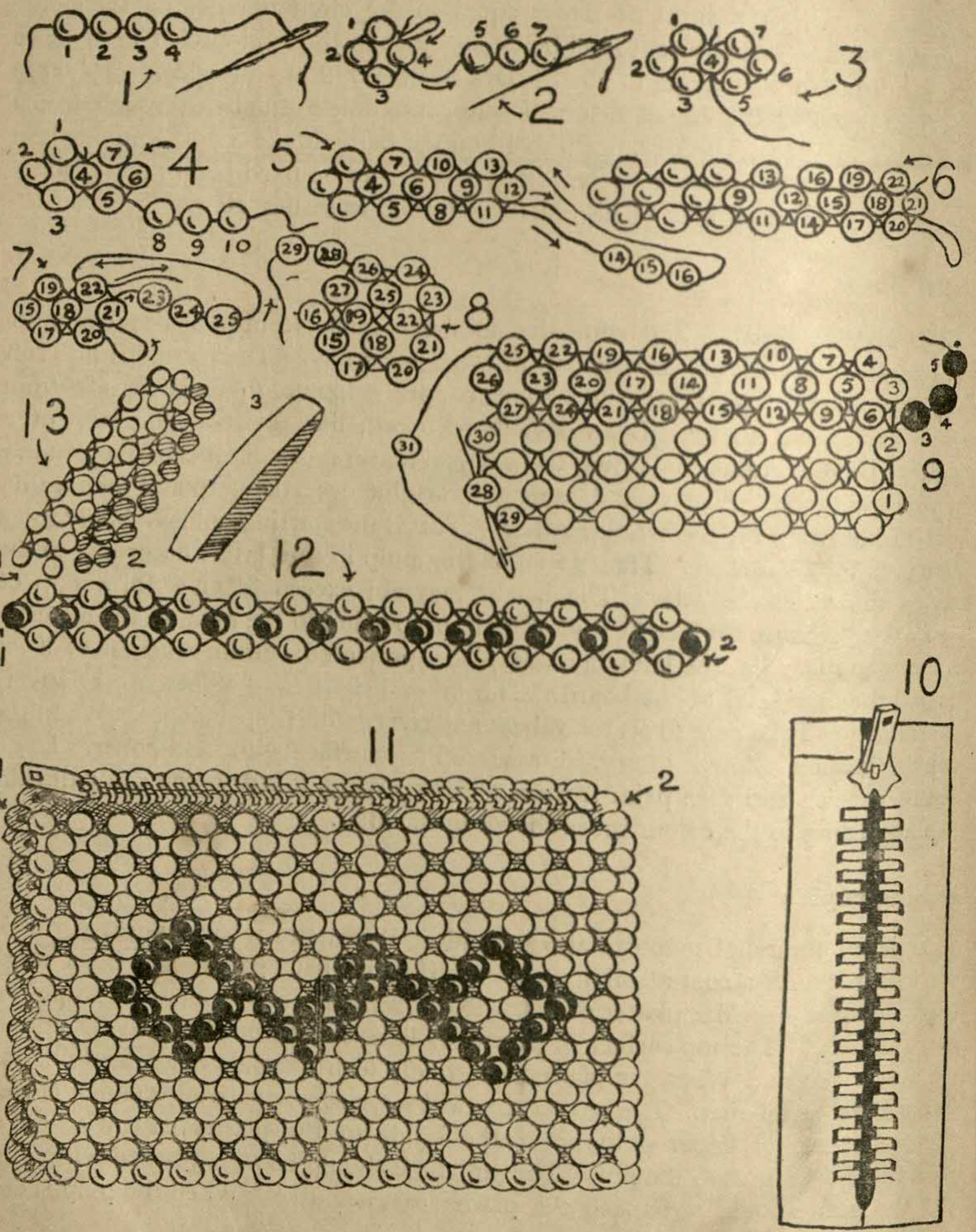
It is very interesting and educative to make maps from papier mache pulp. Soak small strips of old newspaper in water for a day. Then grind it into soft pulp in a mortar. You may add some copper sulphate to make it safe from worms, moths and insects. Draw on a hard board, like plywood, the map of a country. Have an atlas containing the physical features or contours of the country for your guidance. First spread some gum or glue over the map and then a thin layer of the pulp on the whole surface. This is the starting point. Apply some more gum to the surface. Then go on adding pulp in thin layers according to the heights shown in the atlas. The height may not exceed 3″ or 4″ for a map of 3′×2′ size, because the height cannot be in proportion to the area of the country. In the map of India, the Himalayas may be represented within a height of 3″ or 4″ from the base level of the board. The other heights and slopes are relatively determined. Take care to set the valleys and rivers with proper slopes. When the map is finished, allow it to dry. Smooth off the surface with sand-paper. Lay a coat of varnish and then paint it white all over. When it is dry, you can paint the map according to the colour index shown in the atlas.

Making copies

Copies of the relief map can also be made. When the whole map is perfectly dry cover it with a coat of oil and spread strips of tissue paper over it to reach every depression. Mix plaster of Paris to a consistency of thick paste and pour it over the map. The top surface of plaster of Paris should be flat. Avoid adding too much weight. When the plaster sets, gently turn it upside down, and take off the original relief map. The plaster cast will serve as a negative for taking copies. Prepare plenty of paper pulp, cover the inside of the plaster cast with oil or vaseline and fill it with the pulp. The pulp itself should be strengthened with gum. But the gum should not reach the plaster cast negative. When the pulp is dry, remove it and polish the map and paint it.

Plate 73

PLASTIC BEAD PURSE



PLASTIC BEAD PURSE

Plate 73

Plastic beads are available in various colours and sizes. The purse which is described here is made of beads of about $\frac{1}{4}''$ diameter. A sealed bag of beads contains about 950 beads. A purse of the size $6'' \times 3\frac{1}{2}''$ requires about 850 beads. For stringing the beads, use thread of the same colour as the beads. Designs as in FIG. **11** may be worked out by using beads of different colours.

Take double thread on a needle and string four beads on it as in 1, 2, 3, 4, FIG. **1**. Tie them together as in FIG. **2**. Take three more beads 5, 6, 7, FIG. **2**. Pass the needle through 4 and tighten as in FIG. **3**. Pass the thread through 5, then take three more beads 8, 9, 10 as in FIG. **4** and pass the thread through 6 and 8. Take three beads 11, 12, 13 and pass the thread through 9 and 11. Each time hold the beads tight. Take beads 14, 15, 16 and pass the thread through 12, 14, FIG. **5**. Take 17, 18, 19, and pass through 15 and 17. Repeat as shown in FIGS. **4** to **7**. The numbers and arrows show the order and manner of stringing. When you have strung the desired length of the purse, say about six inches, using three beads at a time, turn back as in FIG. **7**. After stringing 20, 21, 22,—the end of the lines—pass through 18, 20 and 21, and take beads 23, 24, 25, FIG. **7**, pass through 22 and tighten, and then pass through 23, 24, FIG. **8**. Now take only two beads 26, 27 and pass through 19, 25, 26. Take two beads 28, 29, pass through 16, 27, 28 and tighten. Take two beads at a time till you reach the left end of the line. Take the left end to the right and reverse the top line to the bottom as in FIG. **9**, in which the numbering is begun again from 1.

Pass through 1, 2, and take 3, 4, 5, in the beginning of a line. In the figure the shaded beads show the beginning stage of the stringed beads 3, 4, 5. They indicate the course of stringing. Pass the string through 6, 3, 4, take 7, 8, and pass through 9, 5, 7. Take 10, 11 and pass through 12, 8, 10. Take 13, 14 and pass through 15, 11, 13. Take 16, 17 and pass through 18, 14, 16. Take 19, 20 and pass through 21, 17, 19. Take 22, 23 and pass through 24, 20, 22. Take 25, 26 and pass through 27, 23, 25. Now we have a mat of seven rows of beads as in FIG. **9**.

Fold the mat so that the three rows in the centre are in the lower part and the two rows above are in the upper part and bring 29 opposite 25. Then take the single bead 31 and pass the string through 28, 30, 26. Take three beads, pass through 25 and two other beads as you did with 3, 4, 5 in the beginning. Notice that the beads form diamond shapes throughout. If you understand this, you will be able to string the whole purse easily. When the mat is folded, the three rows in the middle form the bottom of the purse as stated above. Proceed taking two beads at a time and also stringing them into position as you did before. When you reach the other end which is still open, string a single bead, and then three beads and go on with two beads till you complete the line. Now there are three rows in the back. When you effect the turning, take one bead first and three beads next, and two onwards till you complete nine rows both in the front and the back. Repeat the same till you get the required size of the purse.

Inner Lining

When you have finished the purse, take a piece of cardboard which, when folded in half, could go into the purse. Make a cloth cover for the cardboard, stitch the mouth of the cover, fold it, and stitch the zip fastener, FIG. **10**, to the edges of the cover. Insert the cover into the purse and stitch it to the edges of the purse as in 1 and 2, FIG. **11**. Zip fasteners of varying lengths are sold in shops and you should choose the proper length to suit the purse.

For the handle, make a chain of beads as in FIG. **12** and fasten its ends 1, 2 to the corners 1, 2 of the purse as in FIG. **13**. Both ends of the handle 1 and 2, FIG. **13**, may be fixed to the corner 1 of the bag as in a leather bag as in 3 FIG. **13**. The handle may be made of thick ribbon.

TAPE FOR COT

This tape is useful for cots. It can be woven on a simple improvised loom fixed in the open. Its length may be about 100′ and breadth about 1″ to 2″. Strong, thick cotton yarn is suitable for this.

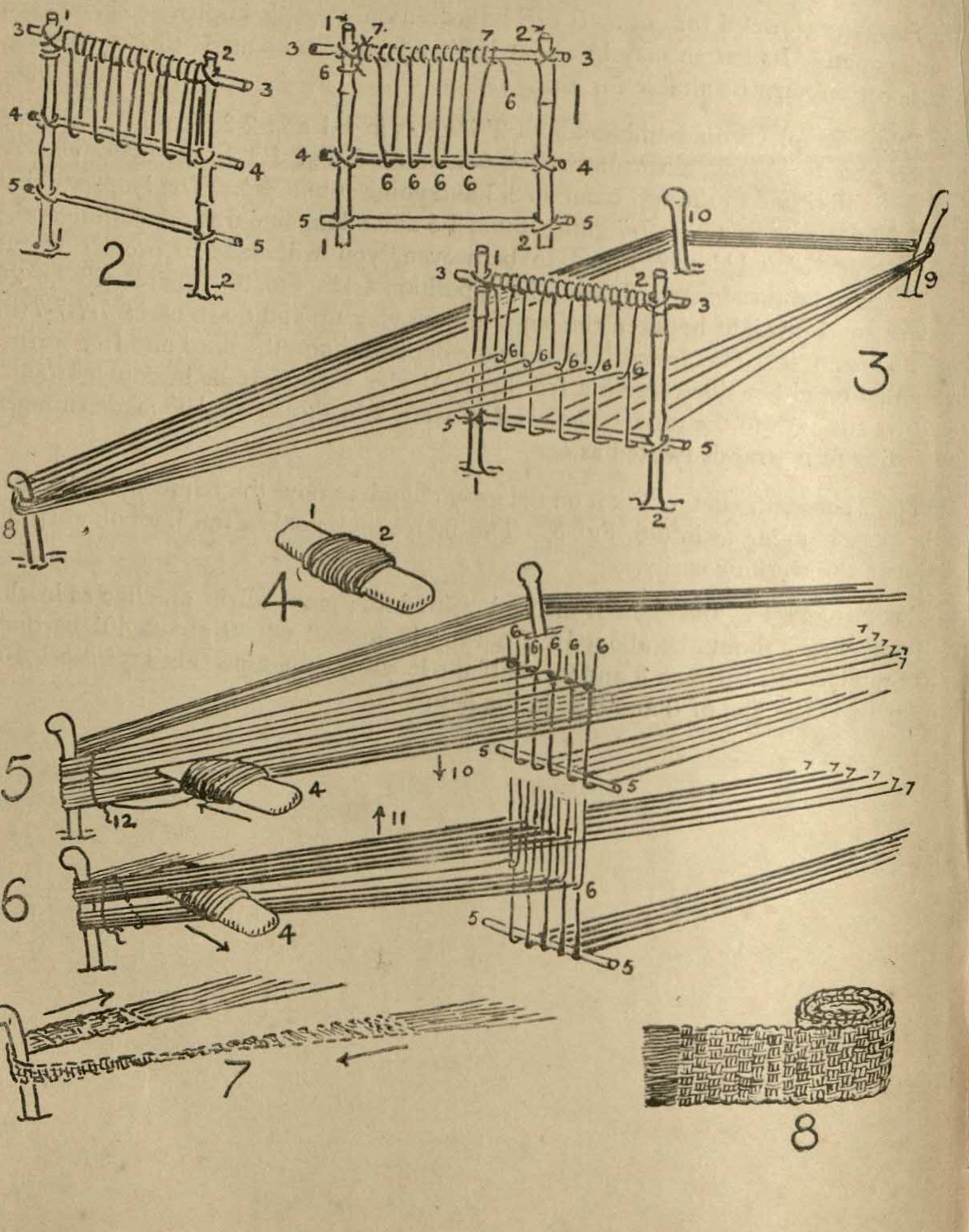
Take two pieces of bamboo about 2′ long as in 1-1 and 2-2, Fig. **1**. Tie three pieces about 1½′ long, across, as in 3-3, 4-4, and 5-5, Fig. **1**. In the figure you see loops 6-6-6-6 tied to the top bamboo 3-3 and going round 4-4. The loops are tied to 3-3 by means of twine 7-7 going round 3-3 and taking in 6-6 at regular intervals. For a tape about 1½″ or 2″ broad to be woven, you will have to provide about 25 loops to hold the warps 6-6 in a fixed position as in Fig. **3**. There will be 26 warps going straight between the loops and moving up and down as in 7-7-7-7 in Figs. **5** and **6**. The breadth of the tape depends upon the fixed and free warps. See that on either side there is a free line. All the warps may be in double strands to give strength to the tape. The woof or weft, 2 in Fig. **4**, may be made stronger by using four strands twisted as one.

Fig. **2** shows the loom. Fix it on the ground and remove the bamboo 4-4 leaving the loops hanging as in 6-6, Fig. **3**. The figure shows only a few lines of warps to explain the working easily.

Fix two pegs 8 and 9 in front and behind the loom all in one line as in the figure. Peg 8 should be about 10′ from the loom and peg 9 about 40′ beyond. The total length between 8 and 9 is half the length of the tape. Fix a third peg 10′ away from the line of 8 and 9 as in the figure.

Plate 74

TAPE FOR COT



TAPE FOR COT

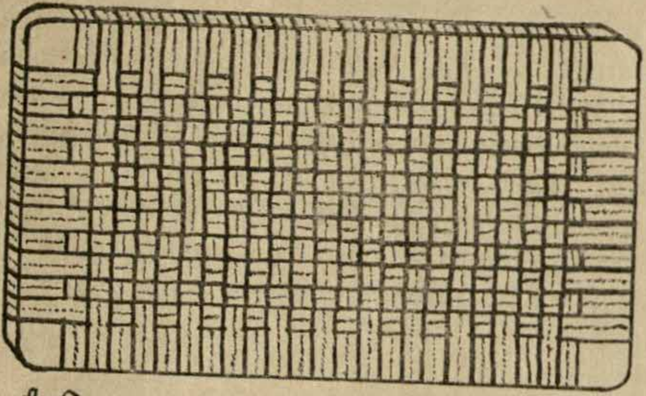
Take the required warp thread, tie one end to peg 8, and take it straight through the loom round 9 and 10 and next round 8. Then pass it through the first loop 6 on the left, then under 5-5, round 9 and 10 and round 8 and continue to lay the warps alternately, once directly and once through loop 6 and below 5-5 and so on, till all the 51 lines are passed through. The last warp should be straight. Bring back the end of the warp to 8 and tie it to the previous line. Remove the first end of the warp originally tied to 8 and tie it to the next line. Now you can rotate all the warps in a bundle round the pegs as well as through the loom.

Weaving

On a flat piece of wood called the shuttle 1, Fig. **4**, wind as much as possible of the twisted thread as in 1-2, Fig. **4**. Tie its end to the warps as in 12, Fig. **5**. In Fig. **3** a few warps going through loops 6-6-6-6 and under the bamboo are shown for the sake of convenience. When all the warps are pressed down or lifted up as shown by the arrows 10 and 11 in Figs. **5** and **6**, gaps are formed alternately under and over the fixed warps. Take the shuttle through the gaps backward and forward, each time pressing the line close, so that the weaving may be strong. When a sufficient length is woven, gently shift the bundle round the pegs towards the left as shown by the arrow in Fig. **7** so as to have the shuttle in front of you. Continue weaving till the tape is complete and cut and release it from the loom and the pegs. Roll it as in Fig. **8**. A cot frame woven with the tape is shown in Fig. **9**, **Plate 75**. This tape has a colour thread laid as warp in the centre.

Plate 75

BRAIDED BELTS



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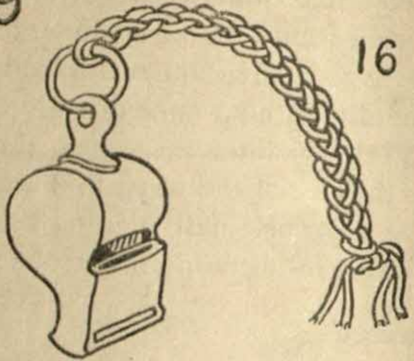

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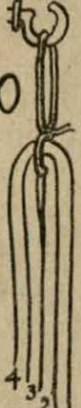

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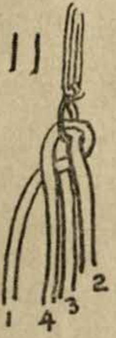

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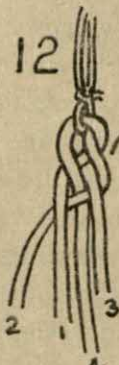

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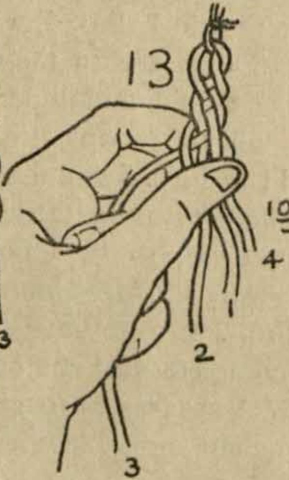

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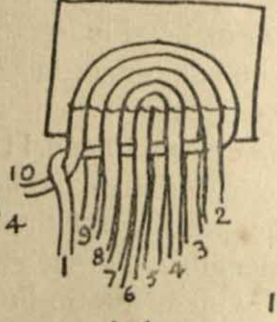

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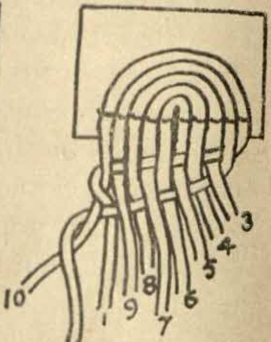

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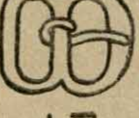

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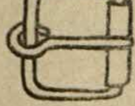

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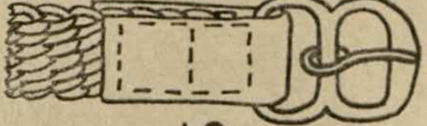

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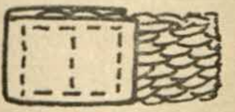

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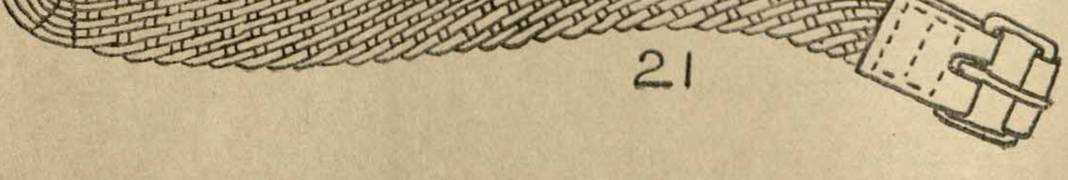
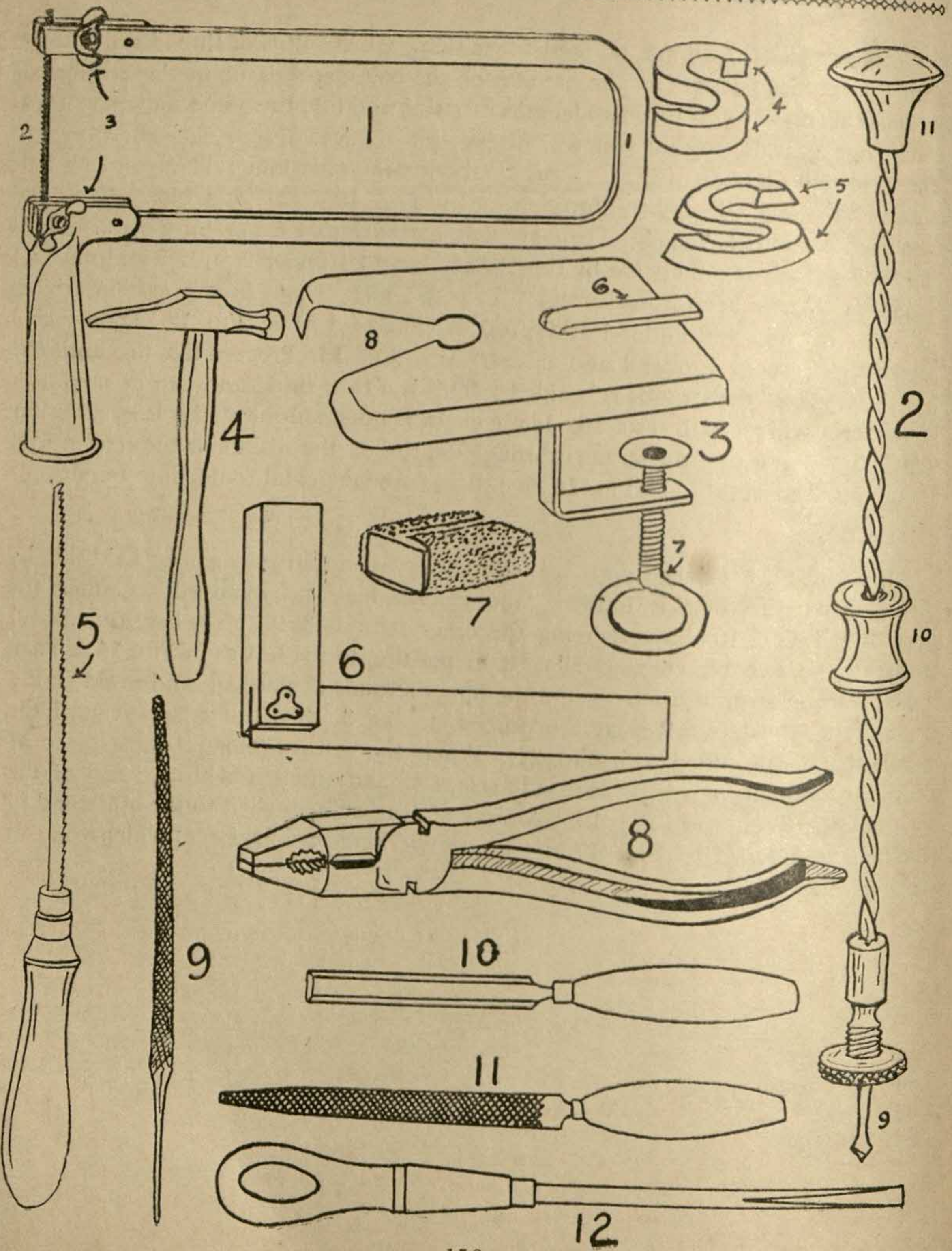


21

Cotton or silk thread can be used for making a belt. Bits of thread are braided into the required length. The breadth of the belt depends upon the number of strands taken. If you take two lengths of string and fold them into halves, you will have four strands, so that you will always get an even number of strands when you fold any number of bits. Strands about two yards long will give you a belt about 32″ long if tightly braided. In FIG. **10**, two long bits are folded into four strands 1, 2, 3, 4. They are tied together and hung on a hook. Hold the four strands together side by side. Take strand 1 under 2, over 3 and under 4 as in FIG. **11** and keep it horizontal. Take 2, which is now in the extreme right, under 3, over 4, and under 1 and press it close to 1 as in FIG. **12**. Then take 3 in the right, under 4, over 1 and under 2 as in FIG. **13**. Proceed like this until the whole length of the strands is braided. This is a thin braid and can be used as a chain for a whistle as in FIG. **16**. If the chain is intended for a whistle or a similar article, you must pass the strands through the ring of the whistle or the article, fold them and then braid. In FIG. **14**, five strings are taken and folded into ten strands 1 to 10.

All strands are stitched on to a piece of canvas so that they can be held side by side. When the belt is finished, the canvas may be removed. Gather the strands 2, 4, 6, 8, 10 above, leaving the other strands 3, 5, 7, 9 below and pass 1 between the two bunches, and lay it in position to the left as in FIG. **14**. Then take the lower strands upwards and the upper strands downwards and braid strand 2 across to the left. Repeat the process, taking 3, then 4, etc. across until the whole length is braided as in FIG. **21**. When the belt is finished, take a piece of leather or canvas, pass it through a buckle, fold and stitch it with the end of the belt held between, as in FIG. **19**. A piece of leather is stitched to the other end of the belt as in FIG. **20**. FIGS. **17** and **18** are two kinds of buckles, of which you can use any one.


2
3
1
1
3
4
5
11
6
8
4
3
2
7
7
5
6
10
8
9
10
11
9
12

Fretwork is an entertaining and a useful hobby. With careful planning and patient work it becomes paying. Simple toys, ornamental articles, furniture etc., can be made. The scope for planning and designing is very wide. Only care and patience in working the models are needed and they do pay.

Tools

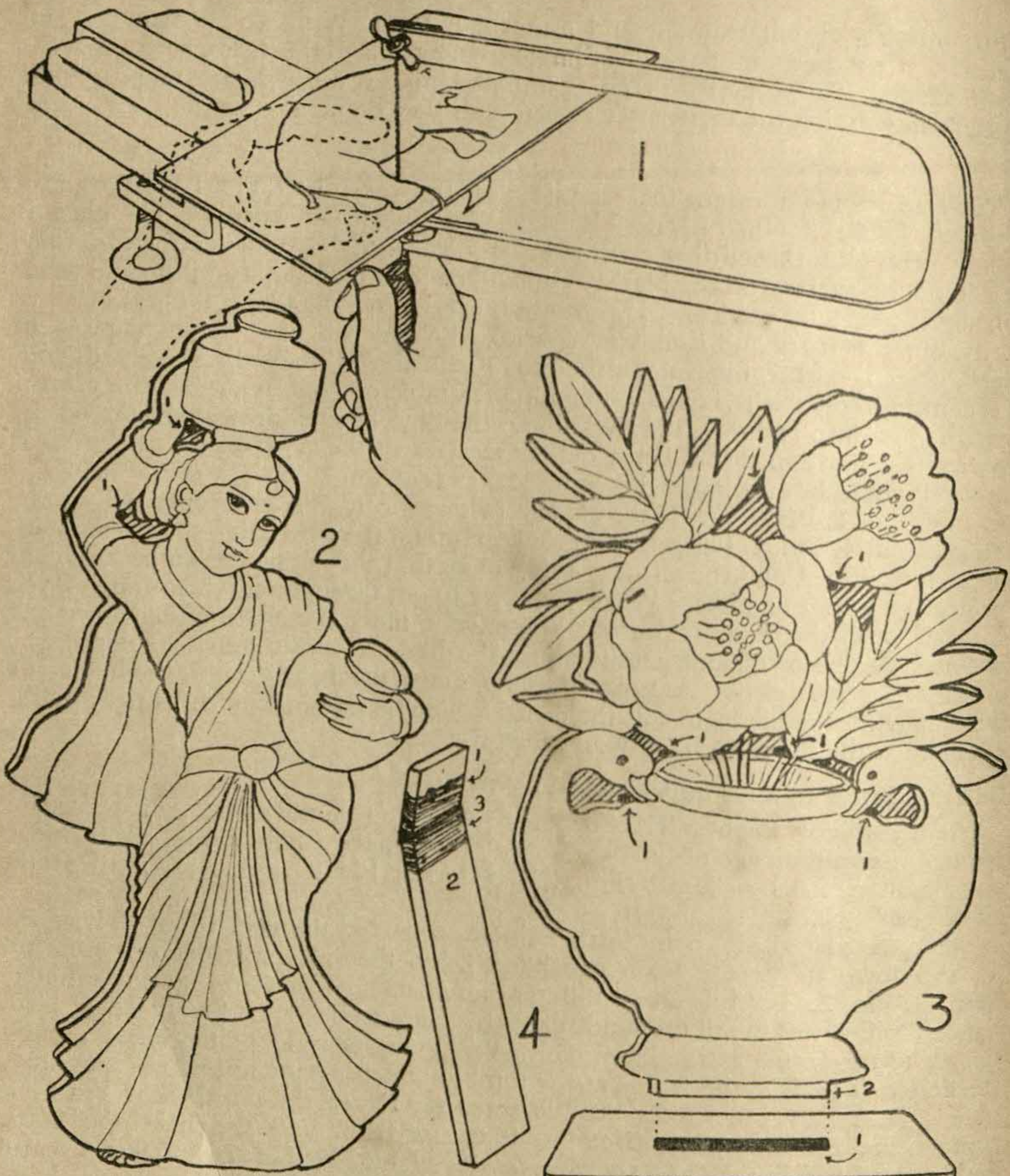
There are some important tools required for fretwork. In 1, FIG. **1** is a **fret saw** frame to which a toothed **blade** 2 is attached by means of **nuts** 3. The blade is tightly fixed with the cutting teeth pointing downwards. While cutting, pressure should not be exerted on the blade. You will have to move the frame up and down holding it perfectly vertical. If pressure is exerted on the blade, it does not move easily, but gets stuck and it may even break. When you have to cut a piece of wood, place it on the **cutting table** FIG. **3** with the 'V' shaped side towards you. The cutting table itself is fixed to the top of a table or stool by means of a **clamp** 6 and 7, FIG. **3**. The saw is moved along the line of the drawing made on the board. The portion that is being cut is exactly over the 'V' space. The board or plywood should be on a level with your chest so that you may work the saw easily as shown in FIG. **1, Plate 77**. If the blade is held vertically, the cut section will also be vertical as in 4, FIG. **1**. If the blade is held slanting, the cut section too will be slanting as in 5, FIG. **1** and the effect of this will be that the cut figures on both sides of the board will not be alike. When you have to cut through curves or angles, you must not push the blade forward. You have to move the blade up and down and turn the blade slowly and gently along the line. As you gain experience, you will find the work easy. As far as possible, move the board to suit the blade and avoid moving the blade to suit the board. The board must be held tight by the left hand while the right hand works the saw.

Cutting inner spaces surrounded by wood

When you have to cut a 'lake' or inner space, you should not reach it by cutting through across the edge of the board. You must make a hole in the 'lake' with an instrument called the **Drill** FIG. **2**. It has a **bit** 9 in FIG. **2** fixed at the lower end.

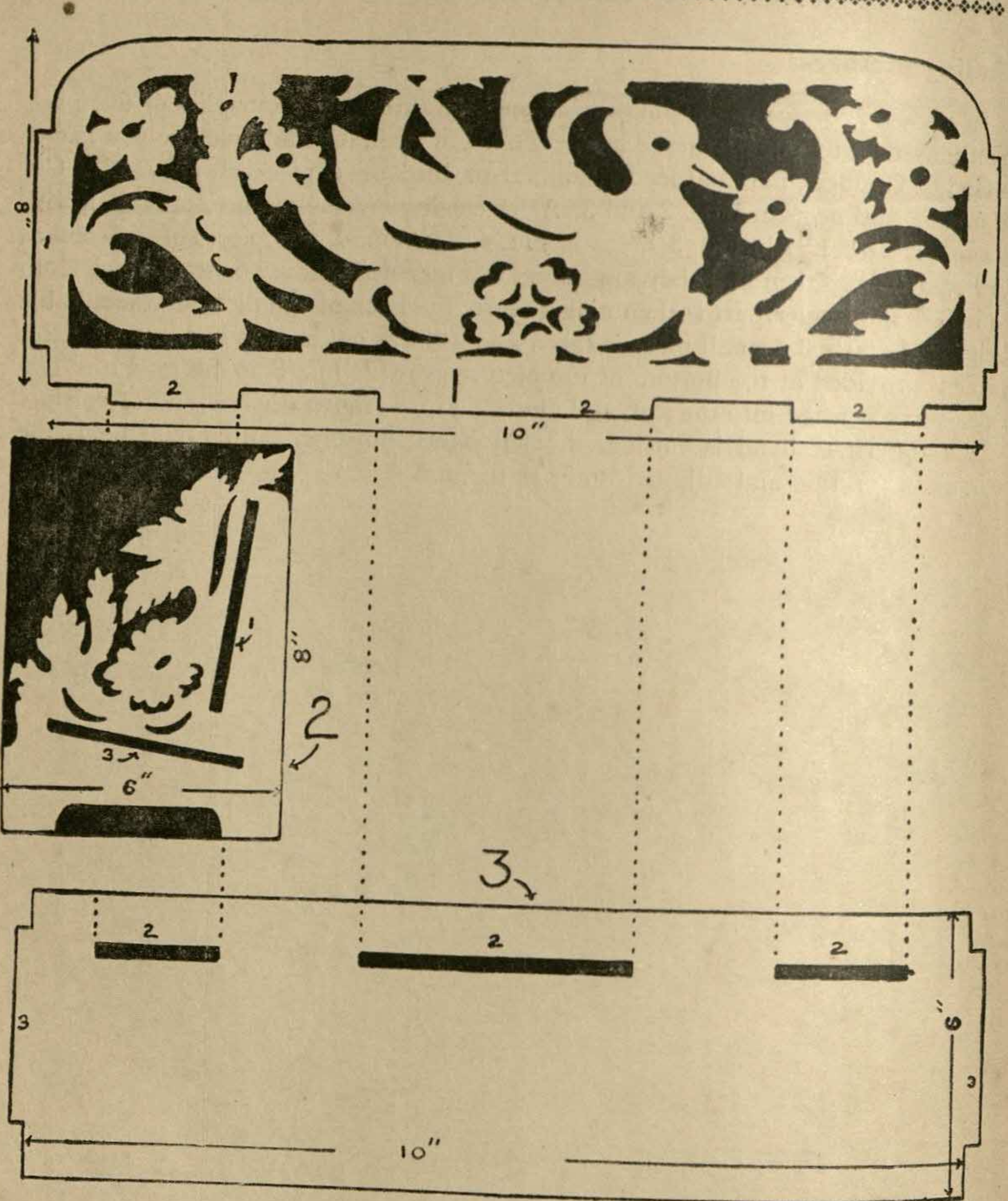
The bit is placed at a point in the middle space and the **reel** 10 FIG. **2** is moved up and down the screw, while one hand keeps the drill pressed down from the head 11, FIG. **2**. The bits are of different numbers suited to make holes of different sizes. Drill holes in all the mid-spaces that are to be cut. Fix the saw blade tightly to the frame at the lower end. Pass the upper end of the blade through the hole and fix it to the frame at the top by tightening the nut with a spanner or plier. There are other tools like the **hammer** FIG. **4**, the **small saw** FIG. **5**, the **square** FIG. **6**, the **cutting plier** FIG. **8**, **round file** FIG. **9**, the **chisel** FIG. **10**, the **half round file** FIG. **11** and the **screw driver** FIG. **12**. FIG. **7** is a piece of **sand-paper** folded round a piece of wood to make a pad. The surface and edge of the wood are rubbed with sand-paper pad to make them smooth. The round file is used to make the cut edges at curves and angles smooth and well formed.

For fretwork, teak and rose wood planks of ½″ thickness and plywood are used.


1
2
1
3
4
1
3
2
1
1
1
1
1
1
2
1

Cutting pictures

In plywood there are varying thicknesses like three-plies, four-plies or five-plies. You may use any one of these kinds. To begin with, stick any picture you like of a God or Goddess, national leader, animal or bird on a piece of plywood. Cut along the outline as in FIGS. **2** and **3**. After cutting out the picture, provide it with a support either as in FIG. **3** or as in FIG. **4**. In FIG. **4**, two pieces of plywood as in 1 and 2, are taken and they are bound together with canvas or some thick cloth as in 3. The upper part is then nailed on to the back of the picture at a suitable height. In FIG. **3** a small piece is taken and a slot is cut in it as in 1 and an extra piece is provided at the bottom of the picture as in 2, FIG. **3** to fit into it. The extra piece is fitted into the slot and glued. FIG. **1** shows the method of cutting. When the right hand is cutting, the left hand shown in dotted lines holds the picture in position and adjusts it to work the saw.


8"
10"
8"
6"
6"
10"

BOOK REST

Three designs, FIGS. **1, 2** and **3**, of the three parts of a book-rest are shown in **Plate 78**. FIG. **1** is the design for the back, FIG. **2** for the sides and FIG. **3** for the bottom. Make carbon tracings of FIGS. **1** and **2** on pieces of plywood. Cut out the portions shown in black in the figures.

Make two pieces for the two sides. The projections 1, 1 in FIG. **1** should fit into the slots 1, 1 in the two sides as in FIG. **2**. Similarly projections 2, 2, 2, FIG. **1** should fit into the slots 2, 2, 2, FIG **3**. The projections 3, 3 in FIG. **3** should fit into the slots 3, 3 in the two sides as in FIG. **2**. The fixture should be strengthened by applying glue.

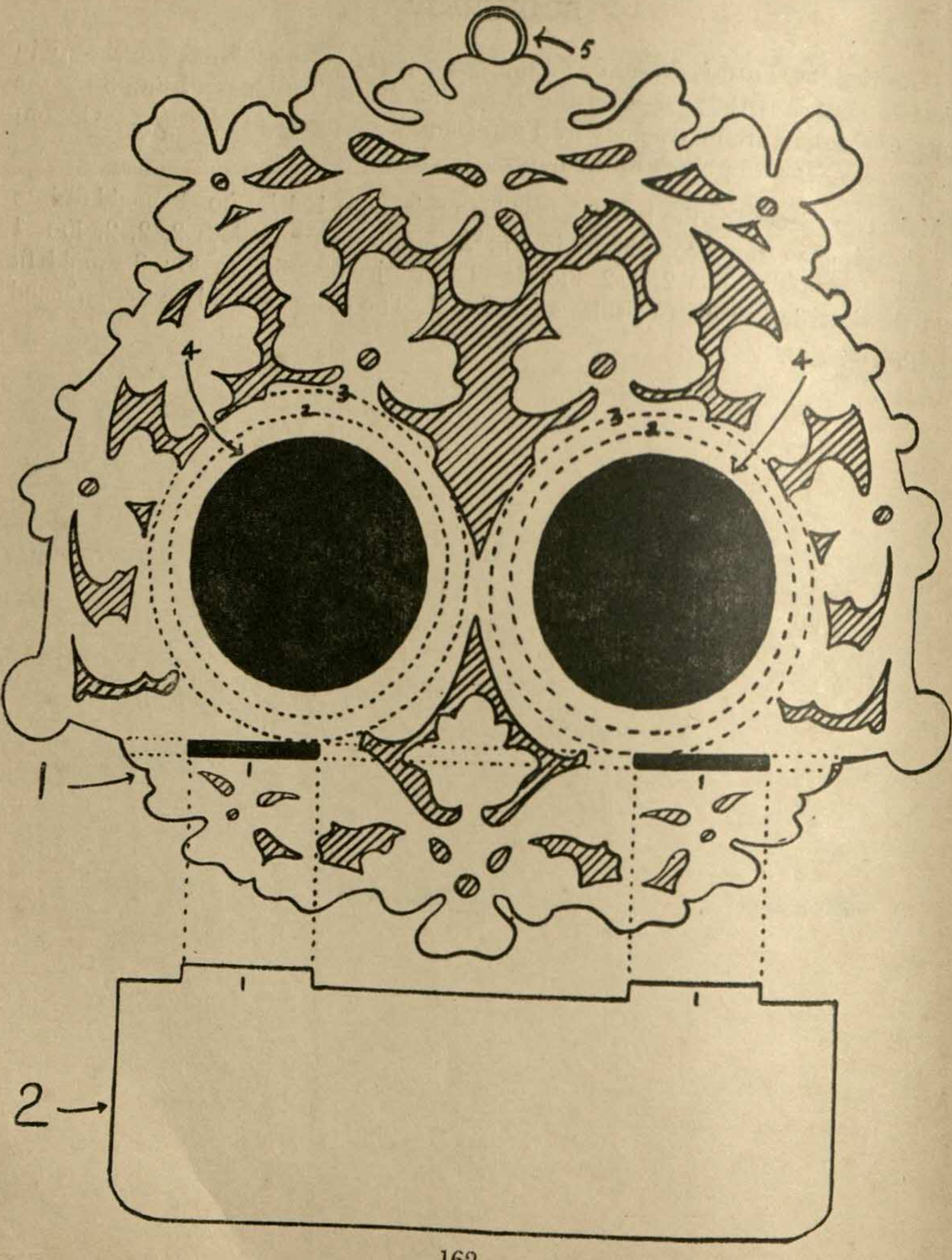


PHOTO FRAME—1

Before making the frame, you must take into consideration the size of the photo that has to be framed. According to this size, draw the design as in **Plate 79**. This design is for two photographs. It has a shelf attached to it. Make a carbon tracing of the drawing on plywood and cut off the shaded portion. Make two slots 1, 1 as in FIG. **1** for the projections 1, 1 in the shelf in FIG. **2**. Fix the shelf with glue. Cut two pieces of wood of the size and shape of 3 in FIG. **1.** In one of them cut out a hole of the size of 2. Get two pieces of glass of the size of 2. Put the glass behind the elliptical opening in the frame, and place the wooden piece 2 surrounding the glass. Place the photograph on the glass and cover it with the wooden piece 3 and nail 2 and 3 to the frame. Attach a ring 5 at the top to hang the frame on the wall.

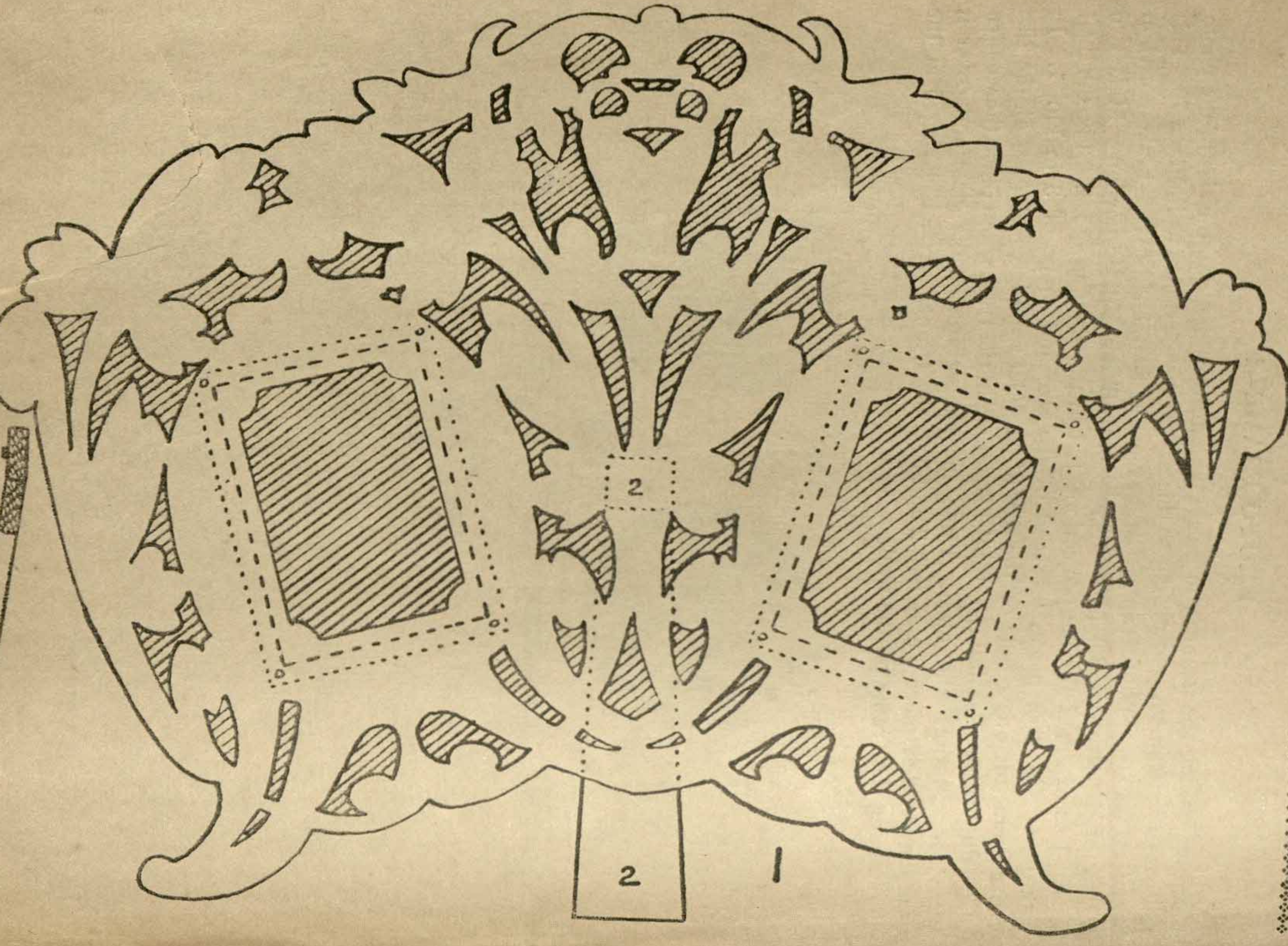
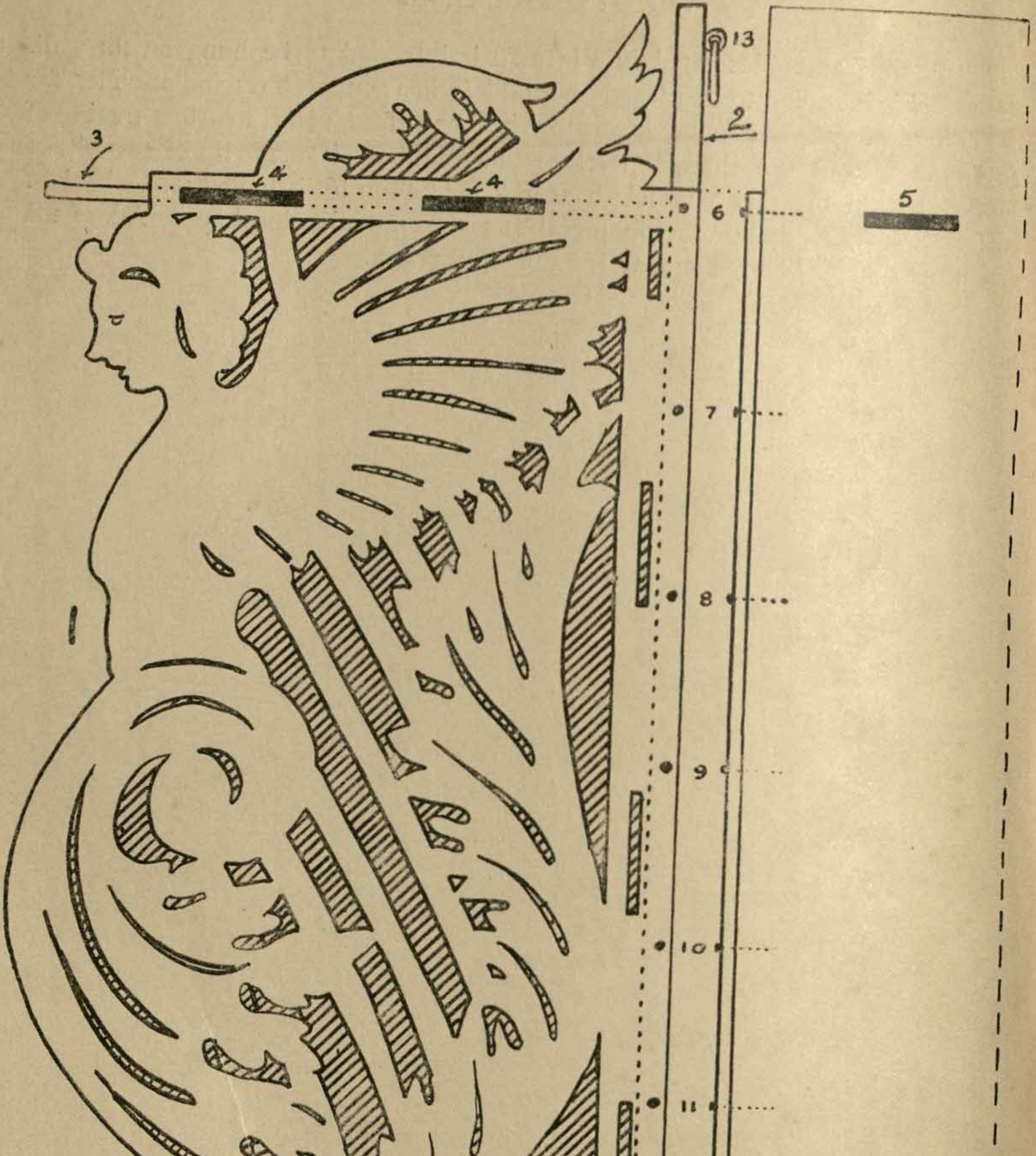


PHOTO FRAME–II

The photo frame illustrated in **Plate 79** is intended to be hung on the wall. This model is intended to be placed on a table. So a support has to be provided for it. Two photographs can be framed in it. As before, make a carbon tracing of Fig. **1** and cut out the shaded portion. The support is made up of two bits of plywood bound together with cloth as in 2. The top bit is nailed to the back of the frame. In this design the photographs are rectangular in shape. Adopt the same procedure as before for framing the photograph.

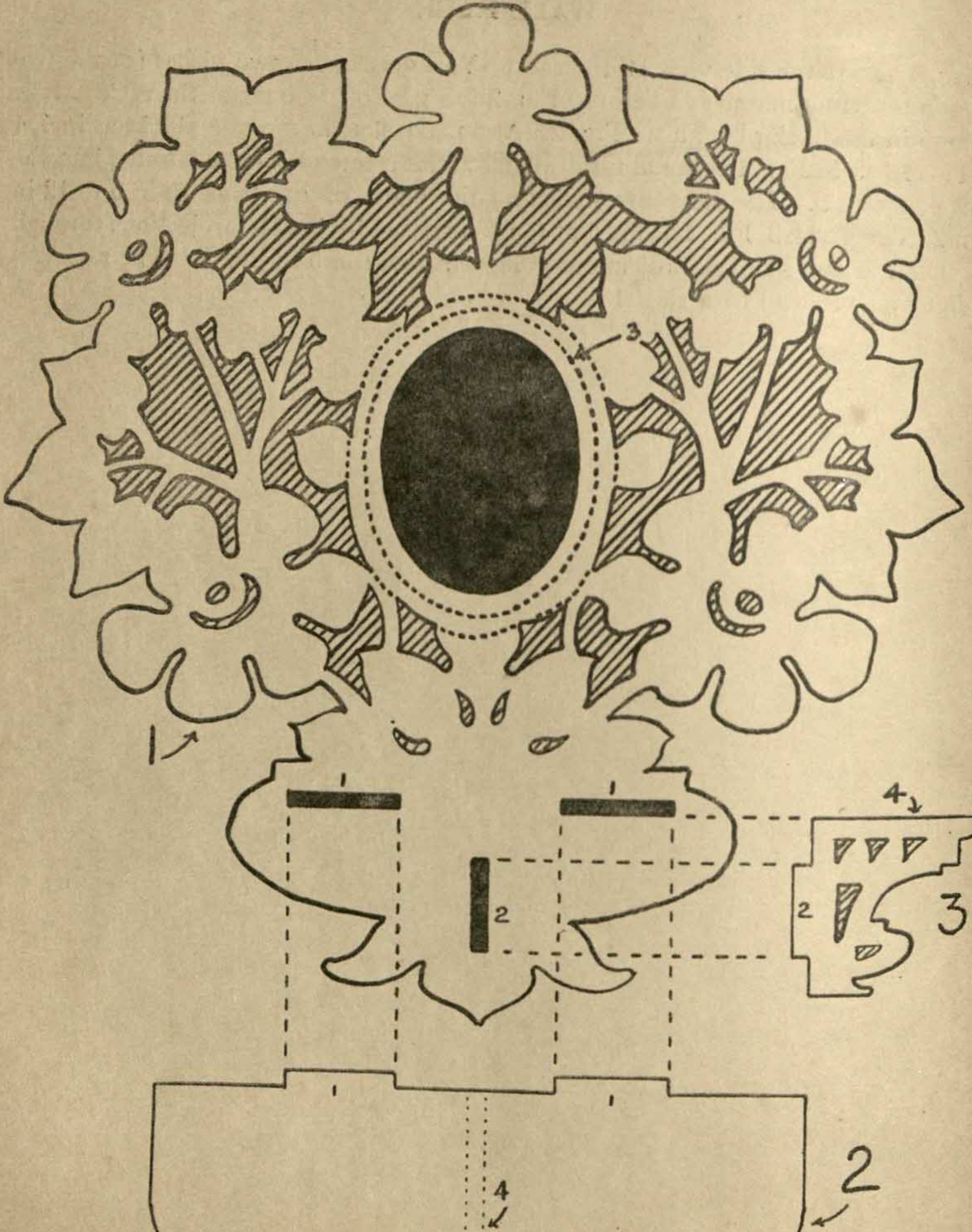
Plate 81

FRETWORK



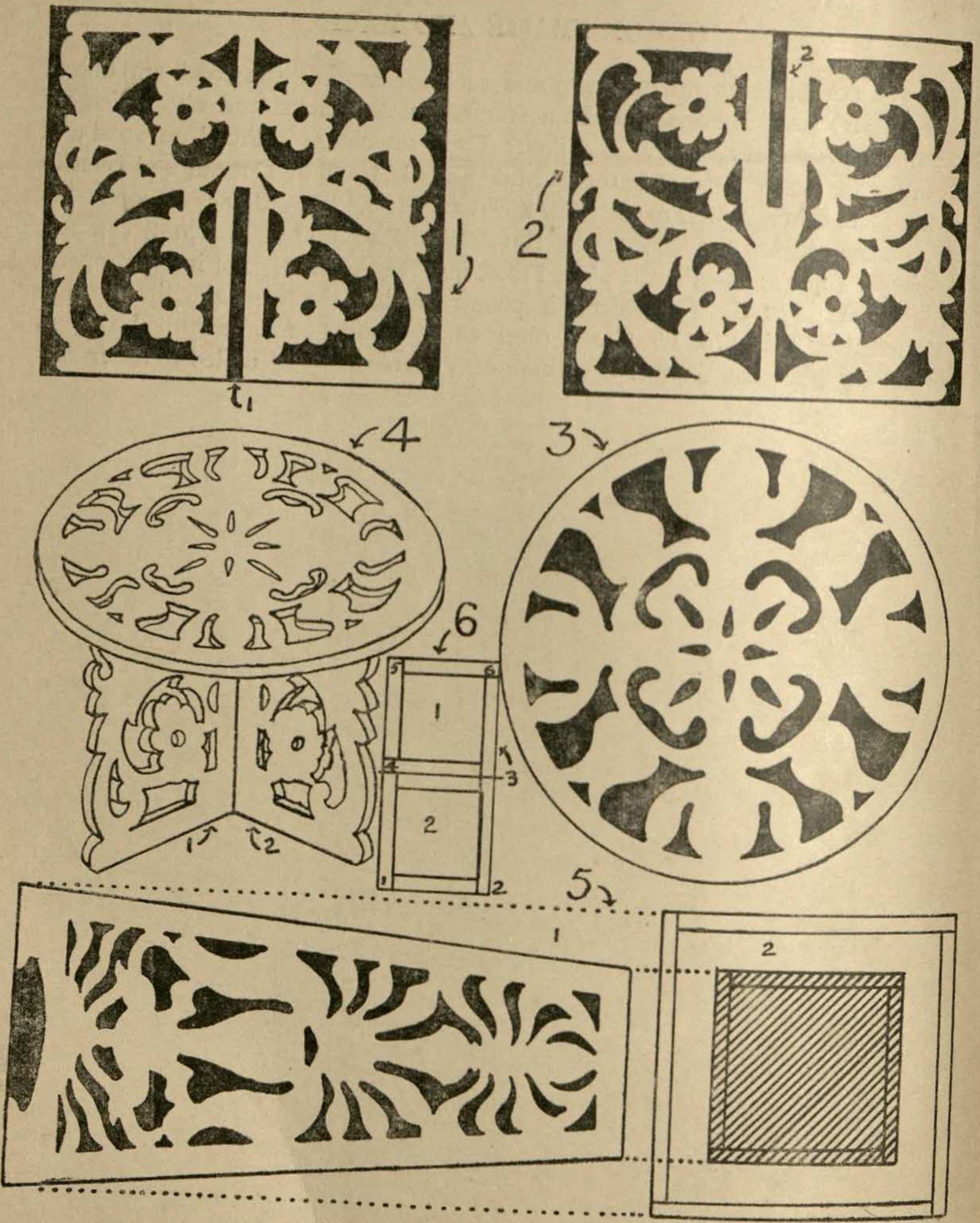
WALL RACK

FIG. **1** shows the side view of the rack. You must make two pieces for the two sides in the same manner as before. FIG. **2** is a part of the back of the rack. Make a slot 5 in the back plank as in FIG. **2.** Also make slots in the side planks as in 4, 4 of FIG. **1.** 3 in FIG. **1** is the almirah plank and it is intended to be inserted into the slots 4, 4 and 5. The sides are nailed to the edges of the back as in 6 to 12 in FIG. **2.** The plank 3, FIG. **1** is fixed at the top resting by its side projections through the slots 4, 4 and its back projections going through slot 5 in FIG. **2.** The rack can be hung on the wall by a ring 13.



MIRROR FRAME AND RACK

This is a combination mirror stand and rack for keeping the comb and one or two toilet articles. There should be a frame for the mirror and also a piece of wood under the mirror to serve as a shelf. Copy the design in Fig. **1** on wood and cut out the shaded portion as before. Make slots 1, 1 and 2. Cut out a piece as in Fig. **2** and another as in Fig. **3**. Fig. **2** is the shelf and Fig. **3** the support. Fix and glue the bracket Fig. **3** into the slot 2, Fig. **1** so that 4 in Fig. **2** can rest properly on 4 in Fig. **3**. Fix the piece Fig. **2** into the slots 1, 1. Let it rest properly on the bracket Fig. **3**. The mirror is placed behind the central ellipse within the dotted line 3 in Fig. **1**. Cut a piece of plywood like an elliptical ring to surround the mirror and cover it with another piece of wood nailed to the frame.


t1

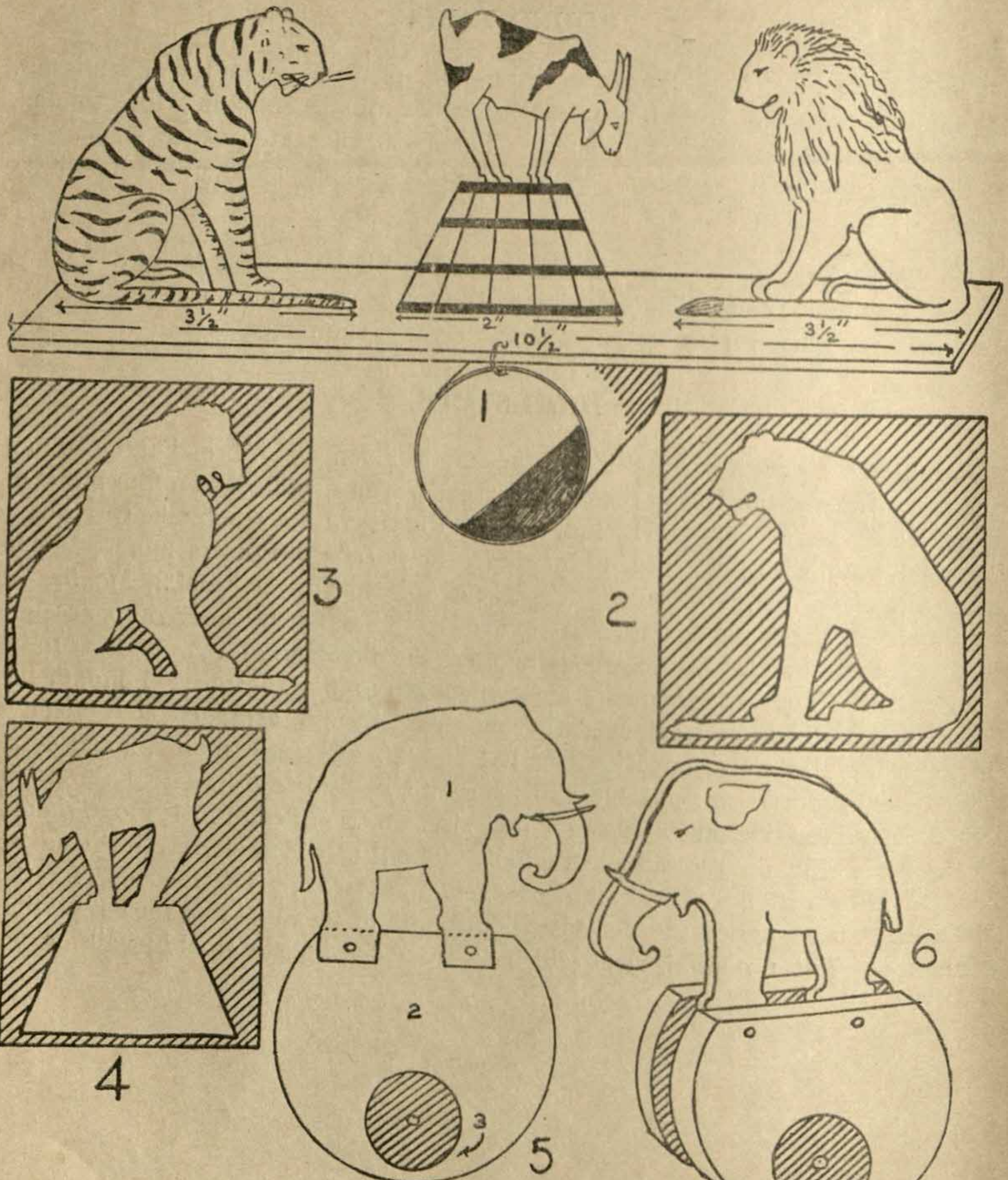
ROUND TABLE

The Stand: FIGS. **1** and **2** are two rectangular pieces in which the design is cut. **1** in FIG. **1** shows a slot from the bottom upto the middle and 2 in FIG. **2** shows a slot from the top down to the middle. These two slots are just as wide as the thickness of the board. When they are slipped into one another, a four-corner stand is formed as in FIG. **4**.

The Top: FIG **3** is the top which is a circular piece. It may be of any shape according to your fancy. The top is not fixed to the stand but is removable. The dimensions can be worked out according to your requirements.

HIGH STOOL

In FIG. **5**, the design for the side of the stool is given. It is broad at the bottom and narrow at the top. Copy the design or make your own design on four pieces of of plywood and cut out as 1, FIG. **5**. For the top of the stool, take two square pieces of wood with sides equal to the dimensions of the bottom or more. In one of them, cut off a square equal to the size of the top of the stool 2, FIG. **5**. In cardboard or paper models, there is no need to take the thickness into account as that is immaterial. But in wooden models the thickness of the wood has to be allowed for. Two arrangements are shown in FIG. **6**. In square 1 FIG. **6**, the square 3, 4, 5, 6 has equal sides so that the sides can be arranged conveniently. But in square 2, the two opposite sides 1, 4 and 2, 3 are longer than 1, 2 and 4, 3. This arrangement is not suitable for fixing up the sides of the stool shown in FIG. **5**, as all the sides are made of equal size. So, the design in 1, FIG. **6** should be chosen. Fix up the sides with nails. Small half-inch nails 1-1 should be used as they will not break the edges of the wood. For the top, fix the hollowed square under the complete board, and fit the stool into the cut portion of the top. This top also is removable as it is not fixed to the stool by nails.


3½"
2"
3½"
10½"

MECHANICAL TOYS

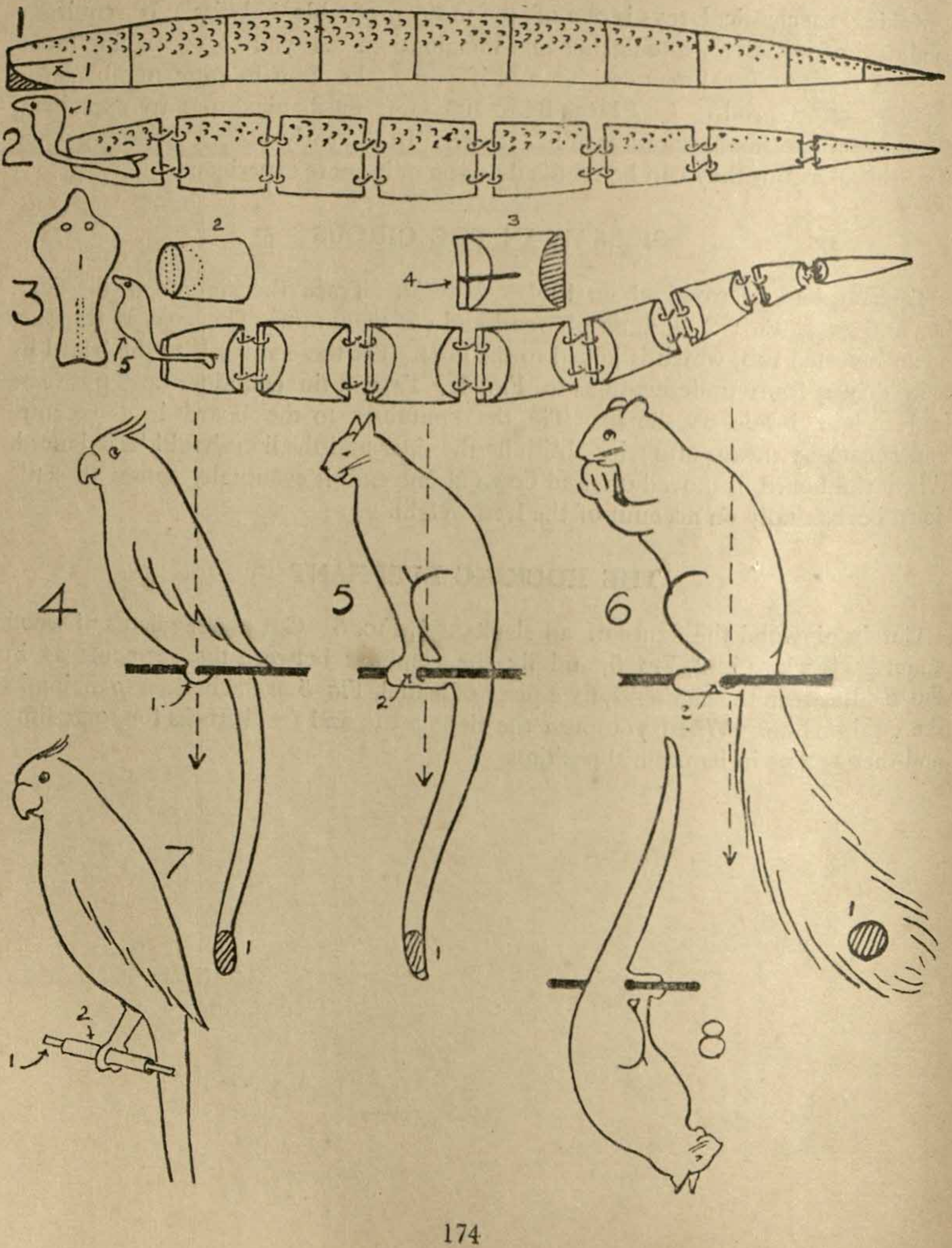
Making mechanical toys is one of the most profitable hobbies. It requires a good deal of initiative, intelligence and imagination. As you go on making them, you will create several new designs, and if you make them in large numbers you can earn good profit. In **Plates 84** to **103** some mechanical toys are explained. Try and make many more toys like these. In the early stages, you may make some mistakes but they can be rectified as you gain more experience.

SEE-SAW IN THE CIRCUS

Take a plank of wood about 10½″ × 2″ × ¼″. Trace the figures of the tiger, lion and goat, FIGS. **2**, **3**, **4**, on plywood and cut them out. The goat is standing on an inverted tub, which is joined to the goat. Fix these animals to the board by nails driven from underneath as in FIG. **1**. Take a tin container and put some lead weight inside as shown. Tie the container to the board in the centre underneath by means of a wire. Initially the tiger and the lion should be balanced. When the board is moved up and down at one end, it eventually comes to settle down horizontally on account of the lead weight.

THE ROCKING ELEPHANT

Cut in plywood the figure of an elephant 1, FIG. **5**. Cut two segments of wood about ½″ thick as in 2, FIG. **5**, and fix the elephant between the segments as in FIG. **6**. Between the segments, fix a piece of lead 3, FIG. **5** at the bottom to maintain the equilibrium. When you push the elephant to and fro, it rocks for some time and then settles in its natural position.


1
x 1
2
←1
3
1
2
3
4→
5
4
1.
1
5
2
1
6
2
1
7
2
1
8

DANCING SNAKE—1

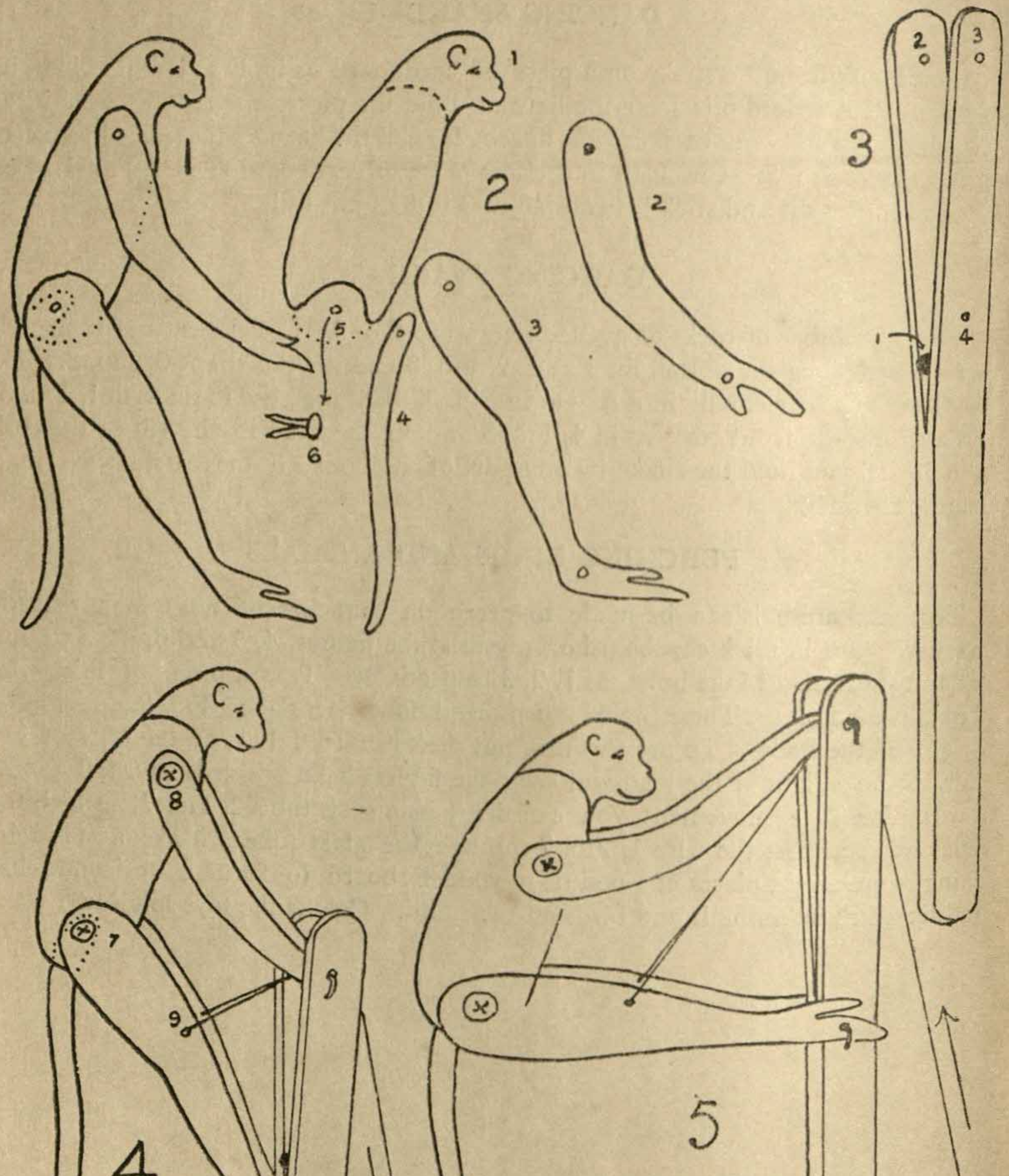
Draw the figure of a snake on a piece of cardboard as in FIG. **1** and colour it suitably. Cut it into bits as in the figure. Bind the pieces one to the other in a row with two stitches in each edge as in FIG. **2**. Cut the head of the snake in a piece of tin as in 1, FIG. **3**. Cut a slit in the first piece of cardboard as in 1, FIG. **1**. Fix the head in the slit and stick it firmly so that it does not fall off.

DANCING SNAKE—2

Select a number of corks of graded sizes as in FIG. **3**. Cut the ends of each cork into a taper along the dotted lines as in 2, FIG. **3** and get the shape 3, FIG. **3**. Tie the pieces together closely in a row as in FIG. **3**. Cut the head in tin as in 1, FIG. **3**. Cut a slit in the front cork as in 4, FIG. **3** and fix the head in the slit of the cork as in 5. If you hold the snake by any part of its body, it moves sideways in a realistic manner.

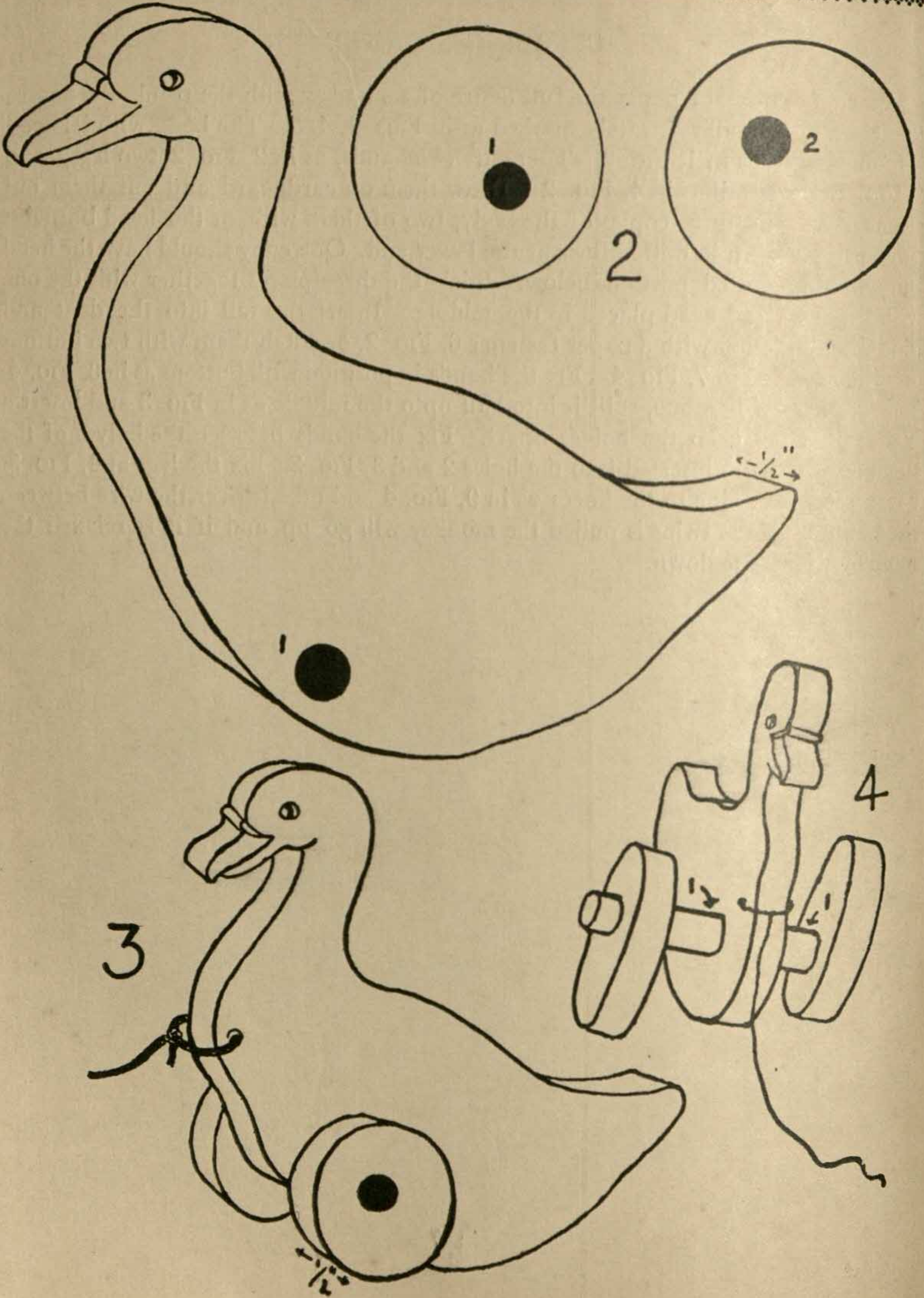
PERCHING BIRDS AND ANIMALS

Birds and animals can be made to perch on branches of trees in a realistic manner. Cut in thick cardboard or plywood the figures, 4, 5 and 6, of a parrot, cat and squirrel. Make holes at 1, 2, 3 respectively. Pass a piece of thick wire through the holes. These figures turn head downwards as in FIG. **8** due to the weight of the body. To prevent this, put pieces of lead 1, 1, at the tips of the tails, as the weight of the lead will keep the figures head upwards and tail downwards. For free movement you can first pass a glass tube 2, FIG. **7** through the hole and then pass the wire 1, FIG. **7** through the glass tube. Make a stand by fixing two upright pieces of wood on a wooden board to form a horizontal bar and fix all these animals and birds on the stand. Colour the toys suitably.



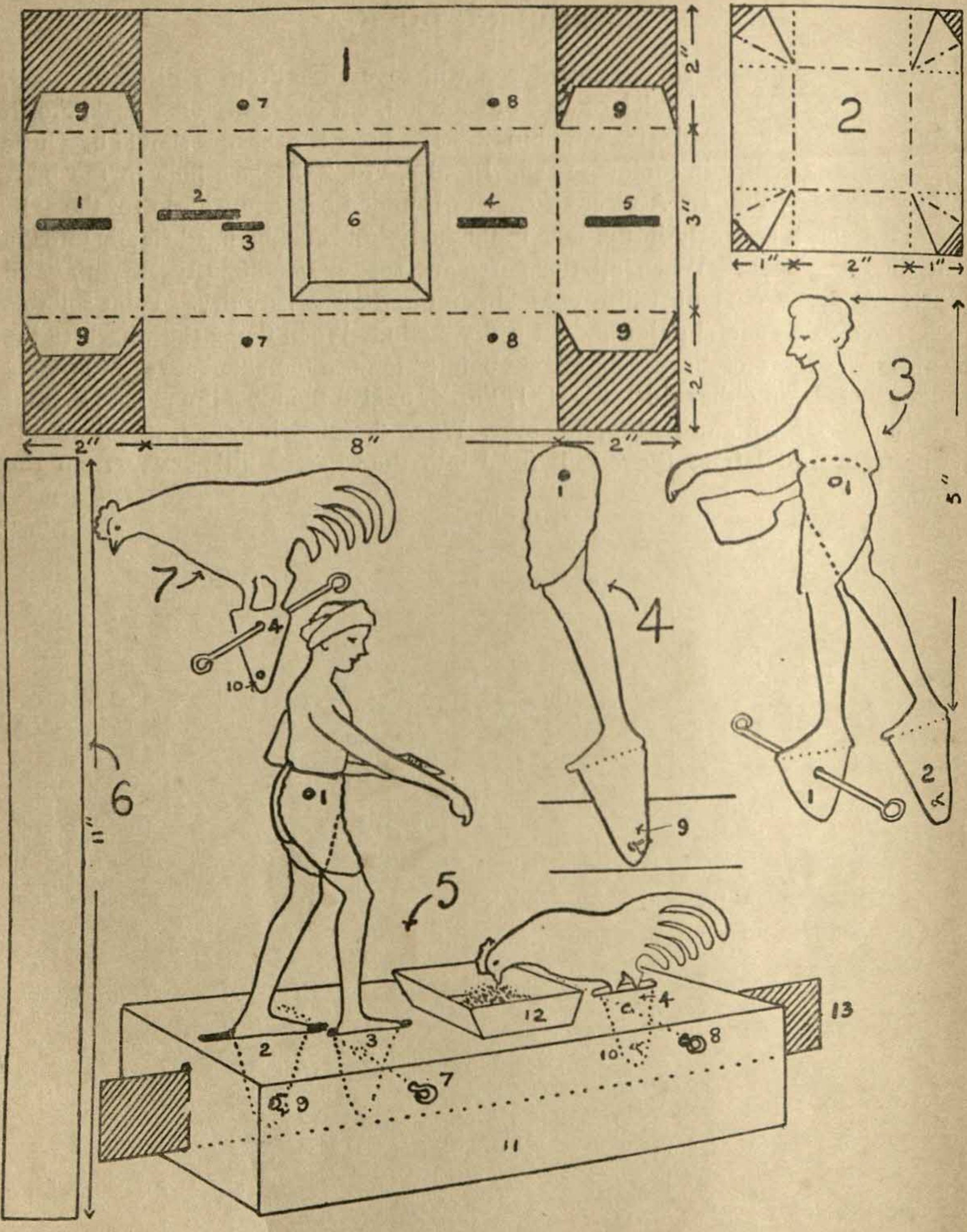
CLIMBING MONKEY

Draw on a piece of paper the full figure of a monkey with the trunk, the hands, the legs and the tail separately marked as in Figs. **1**, **4**, **5**. The body with its head is in one piece, as in 1, Fig. **2**. There are two hands, as in 2, Fig. **2**, two legs, as in 3, Fig. **2** and a tail as in 4, Fig. **2**. Draw them on cardboard and cut them out separately. Cut three copies of the body, two of them without the head but with the portion shown in dotted lines at the lower end. One copy should have the head but not this dotted portion below. Stick the three pieces together with the one with the dent and head placed in the middle. Insert the tail into the dent and bind them together with a paper fastener 6, Fig. **2**, or stitch them with two buttons on either side as in 7, Fig. **4**. Fix the hands in position with buttons as in 8, Fig. **4**. Take a piece of bamboo, split it into half upto the middle as in Fig. **3** and insert a peg as in 1, to keep the halves apart. Fix the hands between the halves of the bamboo with wire inserted into the holes 2 and 3, Fig. **3**. Fix the legs at 4, Fig. **3**. Tie a piece of twine to the knees as in 9, Fig. **4** and take it over the wire between the hands. If the twine is pulled the monkey will go up and if it is relaxed the monkey will come down.


<-½"->
<-½"->

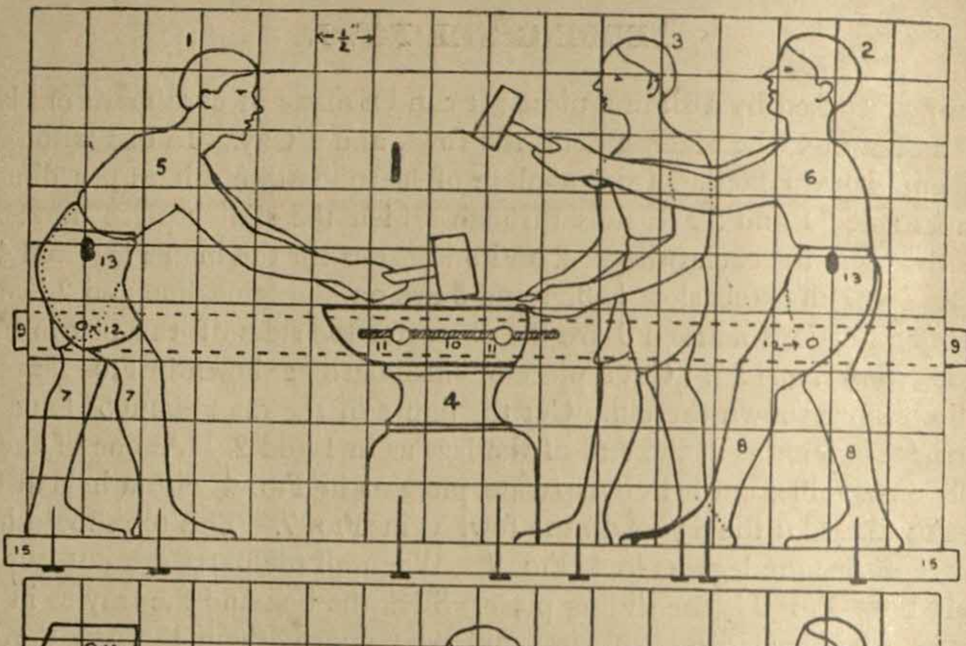
WADDLING DUCK

This is an amusing toy and children will love it. From a piece of wood, plywood or teak $\frac{1}{4}''$ to $\frac{3}{8}''$ thick or any other wood, cut the figure of a duck, FIG. **1.** Cut two wheels of suitable size as in FIG. **2.** The holes for the axle should be a little away from the centre in each case as in 1 and 2, FIG. **2.** Make a hole in the body of the duck at 1, FIG. **1.** A piece of cane or rounded bamboo will do for the axle. The axle must turn freely in the hole in the body but must be fixed rigidly into the holes in the wheels. When all the parts are ready, smoothen them with sand paper. Apply a coat of white enamel paint and allow it to dry. Paint suitable colours over the enamel paint and let it dry again. When fixing the wheels to the body insert pieces of hollow bamboo about $\frac{3}{4}''$ long in the axle between the body and the wheels on either side as in 1, 1, FIG. **4,** to give the toy a broad base so that it can be drawn without its toppling over. When the duck is drawn, it will waddle to the right and left as the axle is fixed into the wheels a little away from the centre.


2"
3"
2"
8"
1"
5"
11"

FEEDING THE FOWL

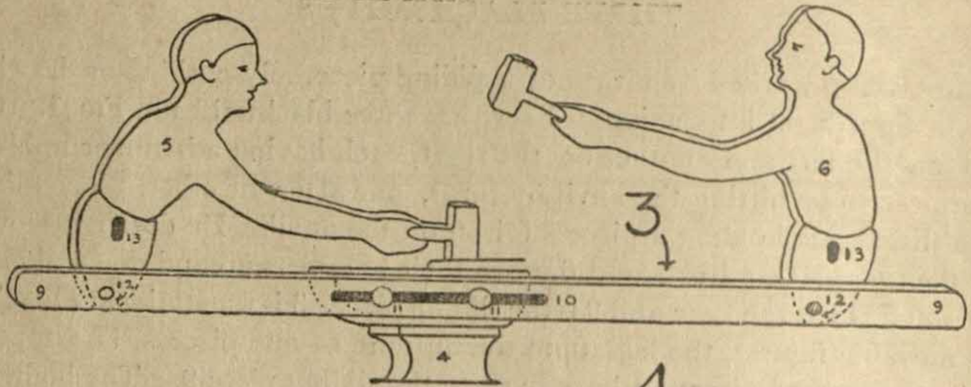
This toy is worked by a sliding piece. It can be made of cardboard or plywood. It consists of a box, the feeding man, the fowl, and a tray. In this lesson a cardboard model is explained. Take a piece of cardboard, cut it as per dimensions given in Fig. **1**. 1 and 5 are slots through which the sliding piece moves. They are exactly opposite each other. 2 and 3 are slots for the man's legs and 4 is for the fowl. Note that the slots 1, 3, 4 and 5 are on the same line and 2 is a little above. The portions marked 9 are the flaps for the sides of the box to be stuck inside the adjoining sides. Cut a piece of cardboard as shown in Fig. **2** according to the dimensions shown therein. Cut the figure of the man about 5″ long, Fig. **3**, providing extra lengths at the end of the legs as in 1 and 2. As one of the legs is to be made movable, cut it in a separate piece as in Fig. **4** with a hole at the top as in 1, Fig. **4**. Cut the figure of the fowl as in Fig. **7**. This too should have an extra piece under the legs as in 4, Fig. **7**. When all the parts are cut out colour them suitably. Fig. **6** is the sliding piece. Stick the box and the tray as in 11 and 12, Fig. **5**. Take two pieces of wire and pass one of them through the hole 7, through the man's leg 3 to the other side of the box. Pass the other piece of wire through hole 8 in the box, through the fowl's leg-piece 4 to the other side of the box. Bend the ends of the wire pieces so that they do not slip off. Pass the sliding pieces 13, Fig. **5**, through the slots 5 and 1 in the box Fig. **1**. Let this piece project outside the box at both ends. Tie the lower end of the fowl's leg-piece 10 in Figs. **5** and **7** to the sliding piece inside the box. Tie the lower end 9 of the leg piece 2 of the man also to the sliding piece. Now you will see that the fowl rests on the piece of wire and moves to and fro by the movement of the sliding piece. Similarly one of the man's legs rests on the wire and the other moves along with the slider. When the slider is pulled on the right side, the fowl bends forward towards the tray, and the man leans forward. When the slider is pushed in, the fowl rises up and the man moves backward. The toy can be made of plywood. In that case the flaps shown in Fig. **1** are not necessary. The sides are fixed to the top of the box with nails and the tray is also fixed with nails. Study the drawings carefully and then it will be easy for you to make this toy.


←1/2"→
12 → O
O 14
O

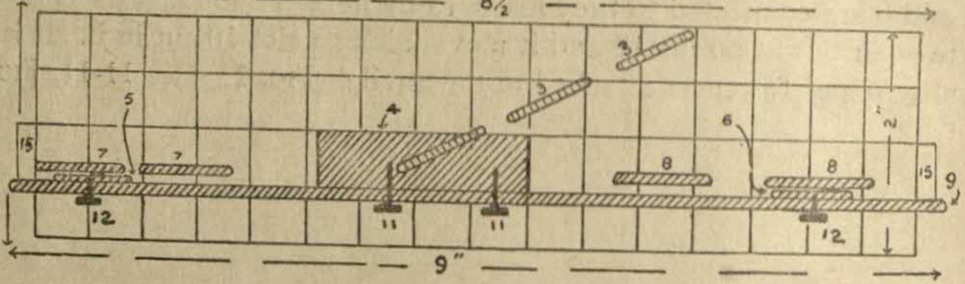
THREE BLACKSMITHS

This toy is also worked by means of a sliding piece. By pushing or drawing the piece, the figures get into action. There are three blacksmiths in FIG. **1**. One of them is on the left and another on the right, each having a hammer in his hand. They appear to be hitting the anvil by turns, one after the other. The third man stands a little aside holding a piece of iron on the anvil. He does not move. In FIG. **1**, the two blacksmiths 5 and 6 move their hammers up and down alternately. 4 is the anvil, 15 is the base and 9 is the sliding piece. 3 is the stationary blacksmith. In the movable figures, the legs upto the hips are of one piece. The upper parts 5 and 6 are separate pieces and are fixed to the sliding piece 9. The bodies of the men 5 and 6 are connected to the hips at 13 by pins. The sliding piece is attached to the two persons at points 12 and it moves along a slot 10 cut in it. It is held in position by paper fasteners attached to the anvil 4, FIG. **1**. See 11-11, FIG. **3**.

3



4

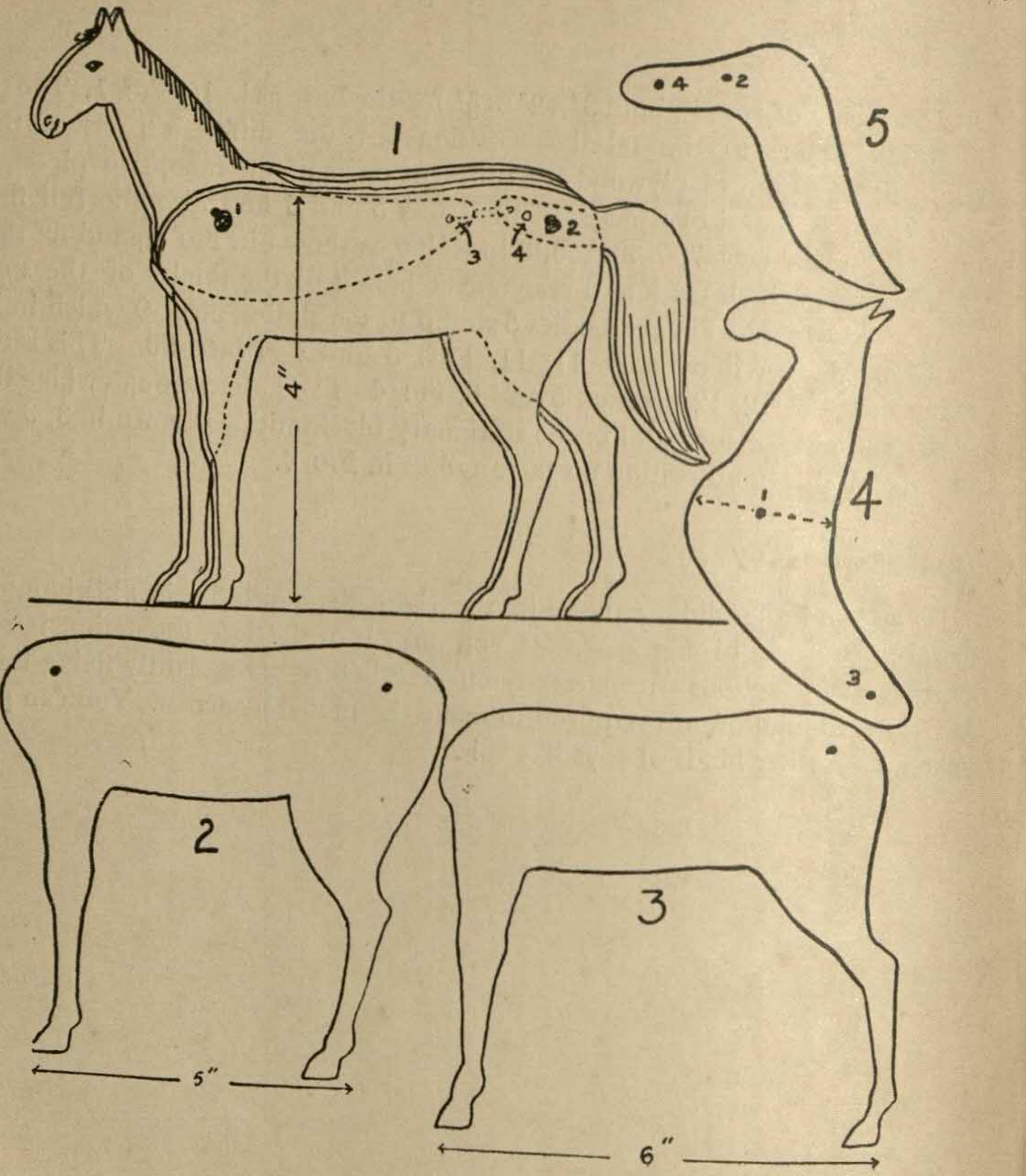


The Base

Take a piece of wood about 9″×2″ ×⅜″ for the base as in 15, Fig. **1.** The squares will guide you as to the relative positions of the different parts of the toy. See Fig. **4**. Cut out of plywood the different parts of the men, two pieces of the legs 7, 7 and 8, 8 and two pieces of the trunk 5 and 6 and also the full figure 3, Fig. 2. Fix the legs 7, 7 and 8, 8 in a line as shown in Fig. **4**, and fix the anvil which is half an inch thick and reaches the height of the thighs of the smiths as in Fig. **1**, **Plate 89.** Fix the bodies 5 and 6 to the sliding piece 9 which in its turn is fixed to the anvil by nails 11, 11, Figs. **3** and **4**, **Plate 90.** This is done by driving the nails 12, 12 through 5 and 6, Fig. **4**. The holes through which the nails are driven must be loose. Fix the stationary blacksmith as shown in 3, 3 with the iron piece in his hand resting on the anvil as in Fig. **4**.

Working the Toy

If you pull the sliding piece to the right, the smith 5 raises his hammer and the smith 6 lowers his hammer. If you push it to the left, the action is reversed. See that these actions are correctly effected before permanently fixing the pieces. Care and calculation are required to make the model a success. You can plan and make many other kinds of toys like this.

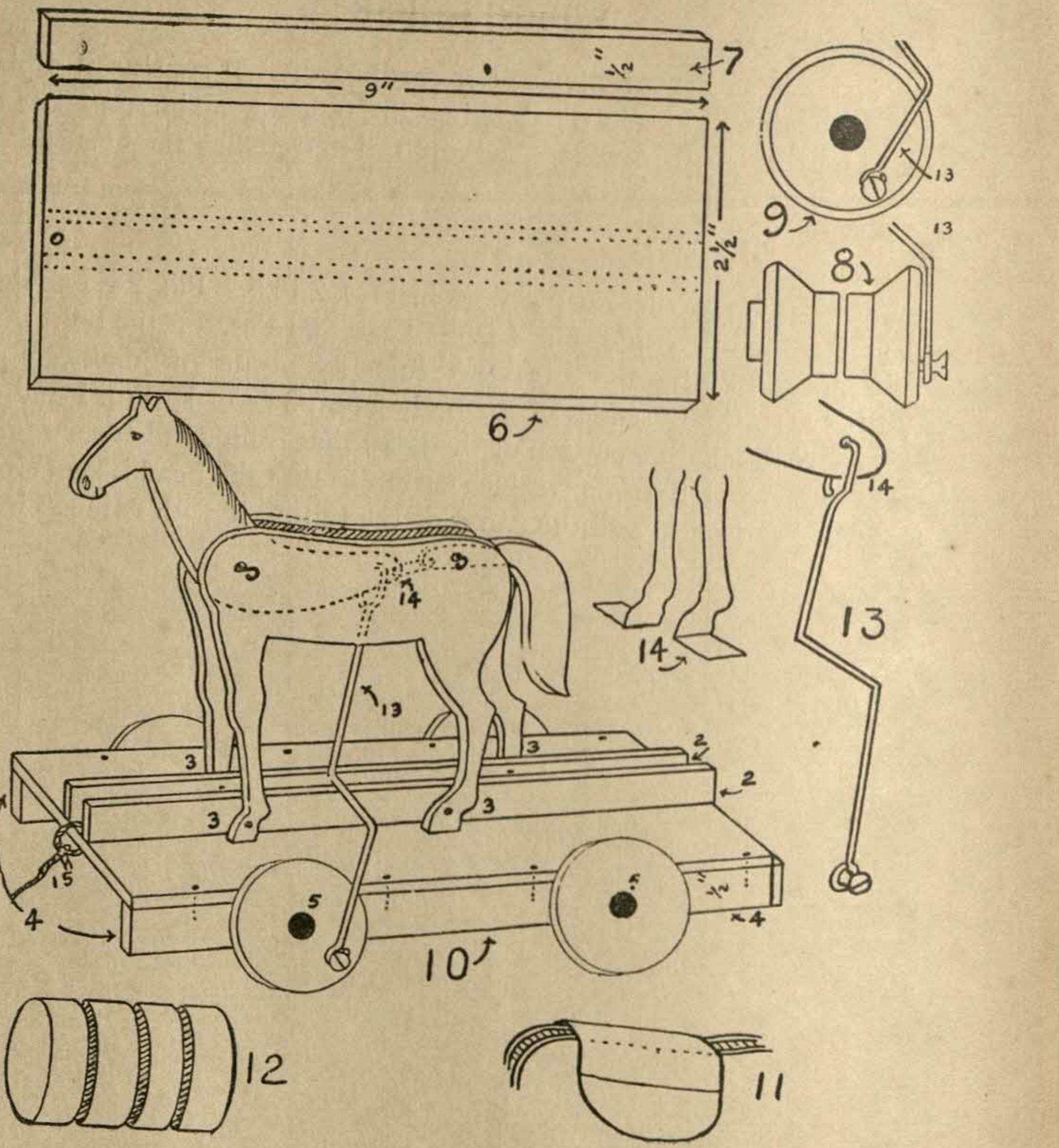

4"
5"
6"

RIDING HORSE

This toy is made either of plywood or cardboard. It consists of a platform and the horse (the dimensions in the drawings are only approximate). The horse's legs are not movable, while only its head and tail move when the horse is drawn.

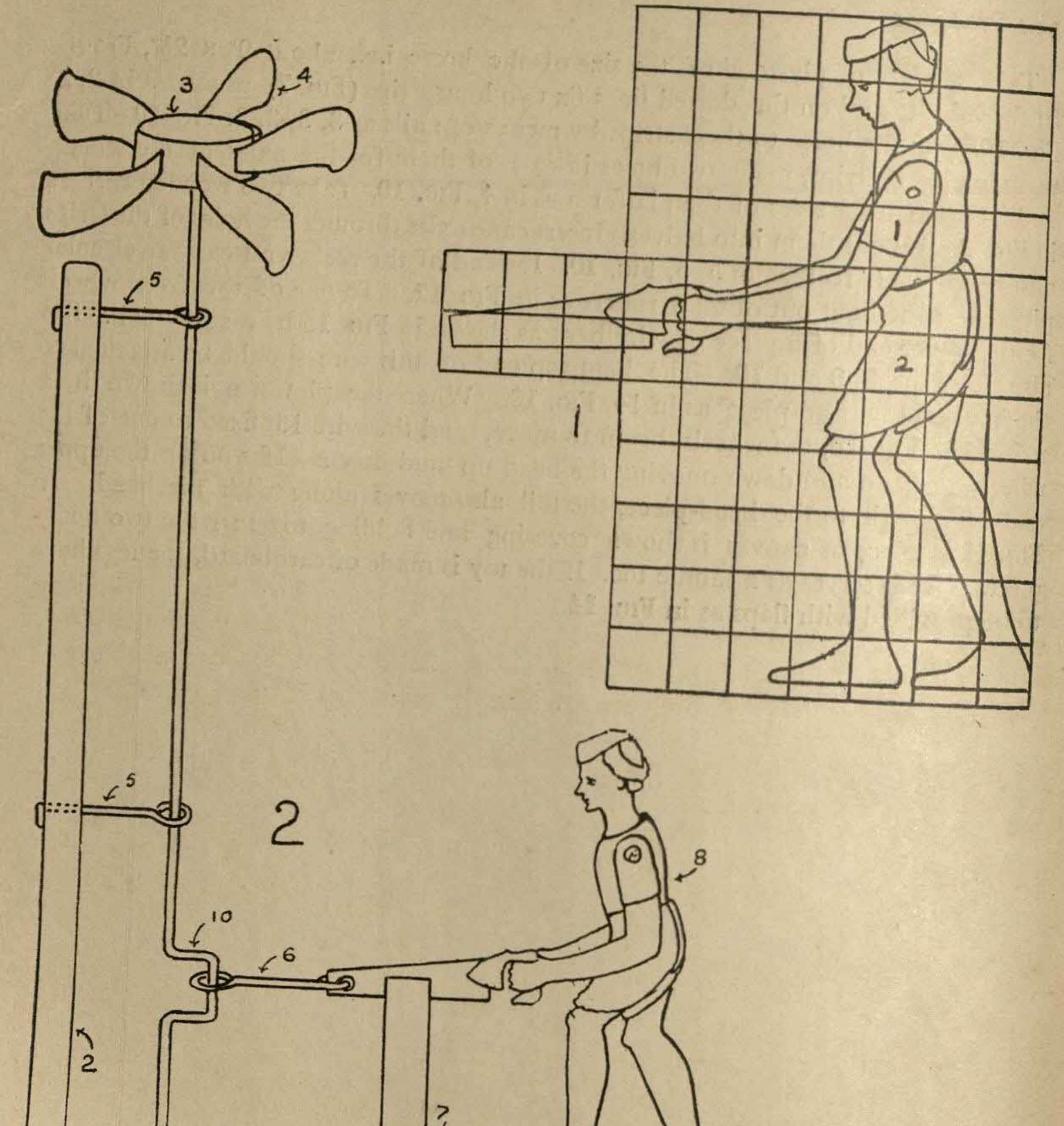
The Horse

The horse is made up of four pieces as in Figs. **2** to **5**. Fig. **2** is one side with two legs, Fig. **3** is the other side, Fig. **4** is the head and Fig. **5** is the tail. Draw the outlines separately on plywood and cut them. By means of small bits of wire, fix the head between the two sides of the body 2 and 3 as in 1, Fig. **1** and the tail as in 2, Fig. **1**. Normally the portion of the head that is hidden between the body-pieces should be heavier than the visible portion so that the head is kept erect. Tie the end 3 of the head-piece and the end 4 of the tail-piece with twine as in Fig. **1.**


9"
½"
2½"

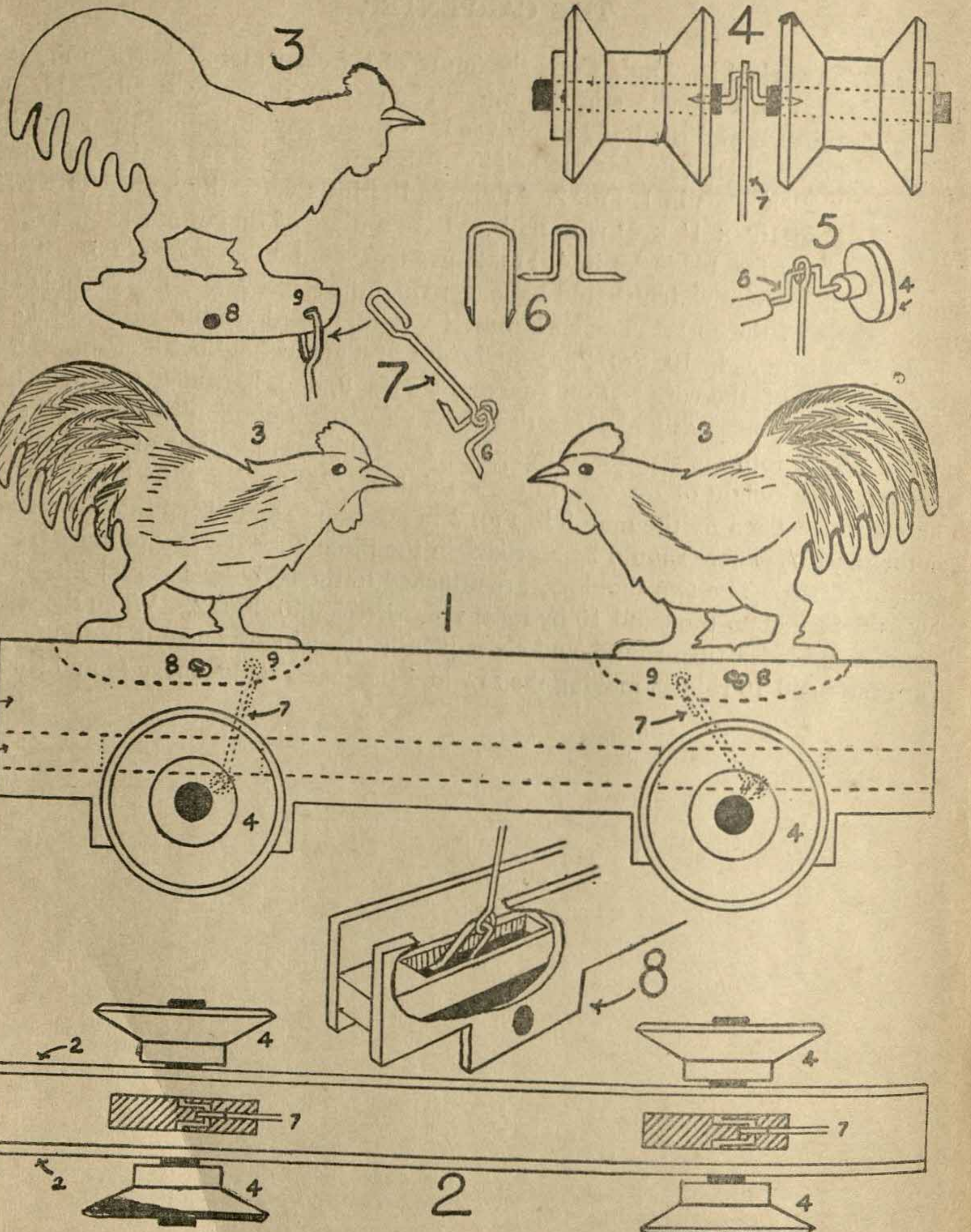
The Platform

Take a piece of plywood of the size of the horse i.e., about 9″ × 2½″, FIG. **6**. In the middle and on the dotted lines fix two long strips (FIG. **7**) as shown in 2, 2, FIG. **10**. Fix the horse to these strips by means of nails as 3, 3, 3, 3, FIG. **10**. Take two more long strips, make two holes in each of them for the axles of the wheels and fix them at the sides of the platform as in 4, FIG. **10**. Take two wooden reels as in FIG. **8**, and cut them into halves. Insert cane axles through the holes of the strips and fix the half reels as in 5, 5, FIG. **10**. Instead of the reels, you can use circular pieces of wood cut out of map rollers as in FIG. **12**. To one of the front wheels fix the lower end of a piece of wire bent as shown in FIG. **13** by a screw nail. See also 13, FIGS. **8**, **9** and **10**. The bent top end of this wire should be attached to the end of the head-piece as in 14, FIG. **10**. When the platform is drawn by a string 15, FIG. **10**, the wheels begin to move, and the wire 13 fixed to one of the wheels goes up and down moving the head up and down. If you tie the upper end of the tail to the head-piece, the tail also moves along with the head. In FIG. **11** a piece of canvas is shown covering and holding together the two body-pieces. This serves as a saddle too. If the toy is made of cardboard, the legs have to be provided with flaps as in FIG. **14**.



THE CARPENTER

This toy is worked by wind. Copy the figure of the carpenter as shown in FIG. 1. The hands, 1, FIG. 1 alone are in two bits. The rest of the body is all one piece. Cut out two hands and the body in plywood. Choose any size. But the stand in FIG. 2 should be at least double the height of the carpenter. Take a piece of wood about 10″ × 2″ × ½″ as in 1, FIG. 2. At one end of it fix vertically a piece of wood 2, FIG. 2 about 10″ × 1′ × ½″ with nails. Take a piece of tin cut out from a food can and cut out five blades as in 4, FIG. 2 and fix them into a cork as in 3. Take a piece of thick wire which should be longer than the stand 2, and fix one end of it in the centre of the cork. The cork must be tightly fixed on the wire. Make a bend in the wire as in 10, FIG. 2, at the height of the saw held by the man. Let the lower end of the wire rest on a piece of glass 9, FIG. 2, which will help the wire to turn round easily. Keep the wire in a vertical position by means of two wire bits fixed into the stand 2 as in 5, FIG. 2. Take another piece of wood which is equal to the height of the saw in the man's hand 7, FIG. 2 and fix it in front of the stand. Then fix the man 8 in FIG. 2 in position so as to keep the saw resting on the piece 7. There should be a groove in the piece 7 for the saw to move freely without tilting. The two shoulders are attached to the body by a loose joint. The saw is attached to the bend 10 by means of wire as in 6, FIG. 2. When the wind blows, the blades turn round and consequently the wire attached to it also turns. Then the bend 10 rotates making the saw and the man's hands move to and fro.



FIGHTING COCKS

This is a funny toy. Study the drawings carefully. In the toy, FEEDING THE FOWL, **Plate 88**, when the man bends forward the fowl rises up and when the fowl bends down the man leans backward. So the movement is alternate. The toy is worked by means of a sliding piece. But in the toy FIGHTING COCKS both the cocks bend forward or go backward simultaneously and work automatically when the carriage is drawn.

The Cocks

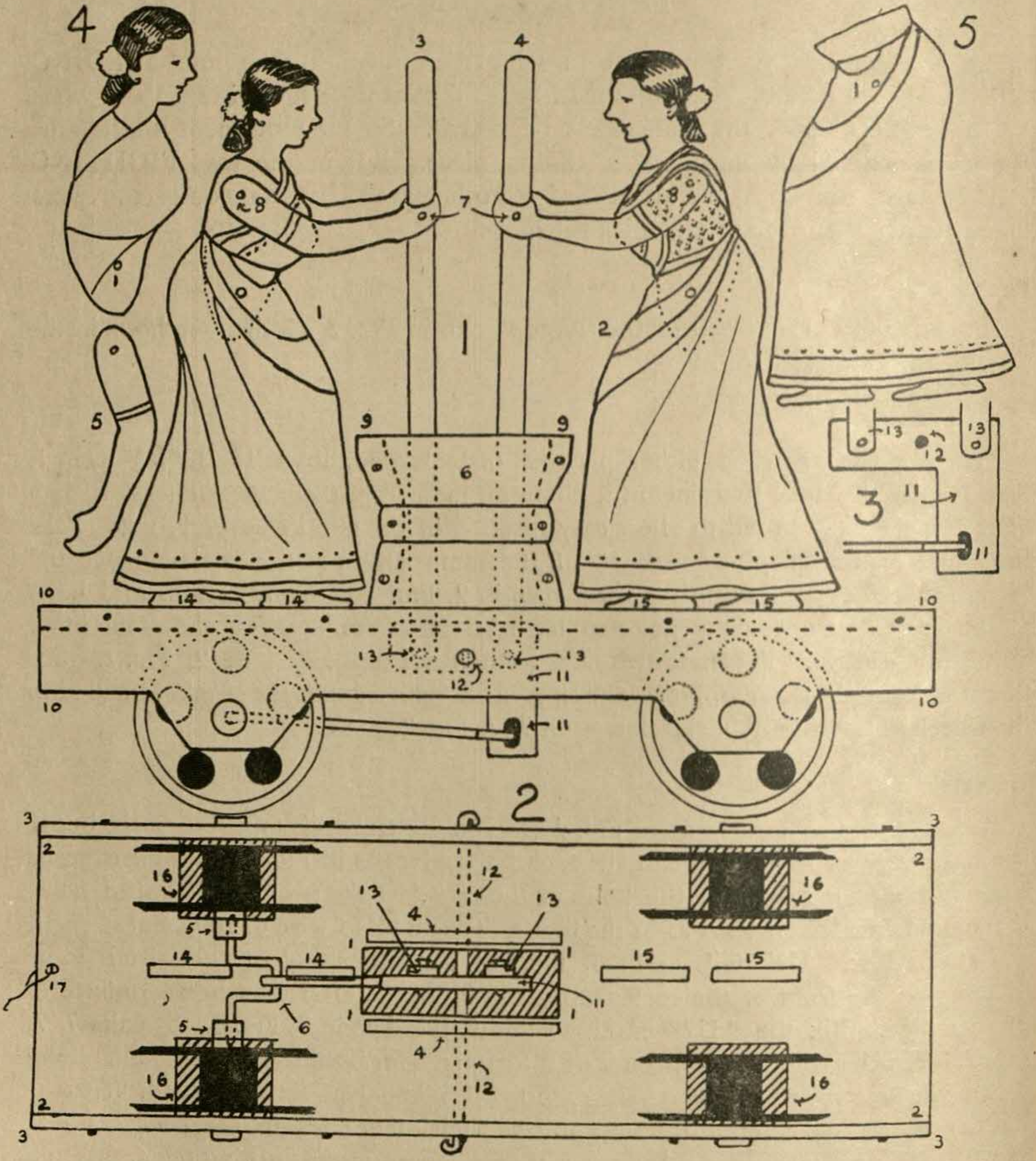
Cut two cocks in plywood of the shape shown in FIG. **3**. Make two holes in the bases of the birds at 8 and 9.

The Carriage

Take a piece of wood, either plywood or teakwood, about 1″ × 1½″ × ⅜″ as in 1, FIGS. **1** and **2**. Make two slots in it about an inch from the ends. The slots may be 1½″ long and ¾″ broad to allow easy rotation of the cranks as in FIG. **2**. Take two more pieces of plywood each of the same length as the carriage piece and 1½″ broad and cut them to shape as shown in 2, FIG. **1** with projections and holes at the lower edge for the axles to be fixed as in FIG. **8**, which shows the inner arrangements also. Fix these two sides to the carriage base as in 2, FIG. **1**. See that the holes are made opposite the slots in the base so that the cranks attached to the wheels rotate freely in the slots as in 7, 7, FIG. **2**.

Wheels

Take two wooden reels as in FIG. **4** (if you use full reels take four reels, but if you have only two reels you can cut each into halves as in FIG. **2**) and fix cane or bamboo axles tightly into the holes of the reels. Take two "U" shaped nails, FIG. **6**, and bend their ends as in the figure. Take a bit of wire of sufficient strength and attach it to "U" nails as in 6, FIG. **7**. The other end of the wire is to be attached to the front of the cock's base as in 9, FIG. **3**, after the wheels are fixed to the carriage. Fix the "U" crank to the wheels **4** as in 6, FIG. **5**. See also 7, 7, FIG. **2**. Fix the wheels at both ends of the carriage for both the cocks. Make holes 8, 8 in the side pieces of the carriage, FIG. **1**. When you fix the wheels, first take out the crank rods through the slots and fix their other ends to the cocks as in 9, FIG. **3**. When the carriage is drawn, the wheels go round turning the crank rods which push the cocks up and down. This gives the appearance of the cocks fighting with each other. Such toys as these require careful planning and neat execution.



THE RICE POUNDERS

This is an interesting toy, which shows two ladies dropping their pestles into the mortar alternately. The toy is fixed to a carriage. When the carriage is drawn the crank attached to one pair of wheels moves a piece of wood up and down and the two pestles attached to the piece also move up and down. This toy can be made in two kinds. In one kind, the hands alone are made to rise and drop to show the pounding action, while the bodies of the pounders are fixed. In the other kind the hands, along with the trunks, are made movable, but the portions below the hip are fixed. Instructions are given for both kinds, the difference being very slight.

The Pounders

Draw and cut out in plywood two figures of ladies without hands as in 1 and 2, Fig. **1**. Cut two bits of wood or cane as in 3 and 4 for pestles, two pieces of mortar as in 6, Fig. **1** and two pairs of hands as in 5, Fig. **1**. Fix the hands to the body as in 8, Fig. **1** and fix the pestles, one between each pair of hands as in 7, Fig. **1** with wire or pin. The joints should be loose. The two pieces of mortar have to be made into one piece by nailing them to small pieces of wood laid between them on both sides as shown by the dotted lines in 9, 9, Fig. **1**. This will give some bulk to the mortar and also provide space between the two pieces for the pestles to move as in a real mortar. The space between them (4, 4) must be greater than the breadth of the slot 1, 1, 1, 1, Fig. **2** in the floor-piece.

The Carriage

For the carriage you require a floor-piece, either of plywood or of ⅜″ thick teak wood, 2, 2, 2, 2, FIG. 2. The floor-piece may be 9″×3″×⅜″. For the sides of the carriage, cut two pieces 2, 3, 3, 2, FIG. 2 of the shape shown in 10, 10, 10, 10, FIG. 1 and fix them to the side of the floor-piece with nails. Make a slot 1, 1, 1, 1 in the floor-piece, in the middle, to suit the size of the mortar 4, 4, FIG. 2. For the wheels, use four typewriter ribbon spools or wooden reels. If the wheels touch the floor-piece, cut slots in the floor-piece to allow the wheels to come through as in 16, 16, 16, 16. If the wheels are small, slots need not be cut. Fix a single cane piece for the axle at one end. For the other end, fix two axle pieces 5, 5, FIG. 2 to the spools and attach a crank between the pieces as in 6, FIG. 2. Fix a piece of stiff wire to the crank at one end and to the vertical arm of the lever piece 11, FIGS. 1, 2 and 3 at the other end. The lever piece rotates on a piece of wire 12, FIGS. 1, 2 and 3 fixed between the sides of the carriage. The two lower ends of the pestles are connected to the horizontal arm of the lever piece at 13, 13, FIGS. 1, 2 and 3.

Working the Toy

Now fix the pounders' legs 14, 14 and 15, 15, FIG. 1 at the places showing same numbers in FIG. 2. If the carriage is drawn by the string 17, FIG. 2, the wheels rotate turning the crank. The crank then pulls and pushes the lower arm of the lever piece 11, FIG. 1. The horizontal arm consequently moves up and down on the wire 12, lifting one pestle and lowering the other. The ladies' hands are raised or lowered accordingly. If you want the hands alone to move, cut the bodies in a single piece each. Fix the hands loosely at 8, FIG. 1, and fix the pestles between the hands at 7, FIG. 1. If you want the bodies also to move, cut the trunk as a separate piece as in FIG. 4, and the hip and legs as another piece as in FIG. 5. Fix these two together at 1, 1, FIGS. 4 and 5. Then fix the hands rigidly to the trunk.

BEASTS ON MERRY-GO-ROUND

This toy affords a lot of merriment to children. It consists mainly of a wooden board on which some animals are fixed and the whole board or platform turns round and round. There are several accessories which provide the movement. In this toy the vertical rotatory motion is transformed into horizontal rotatory motion. Therefore some care is required in making it.

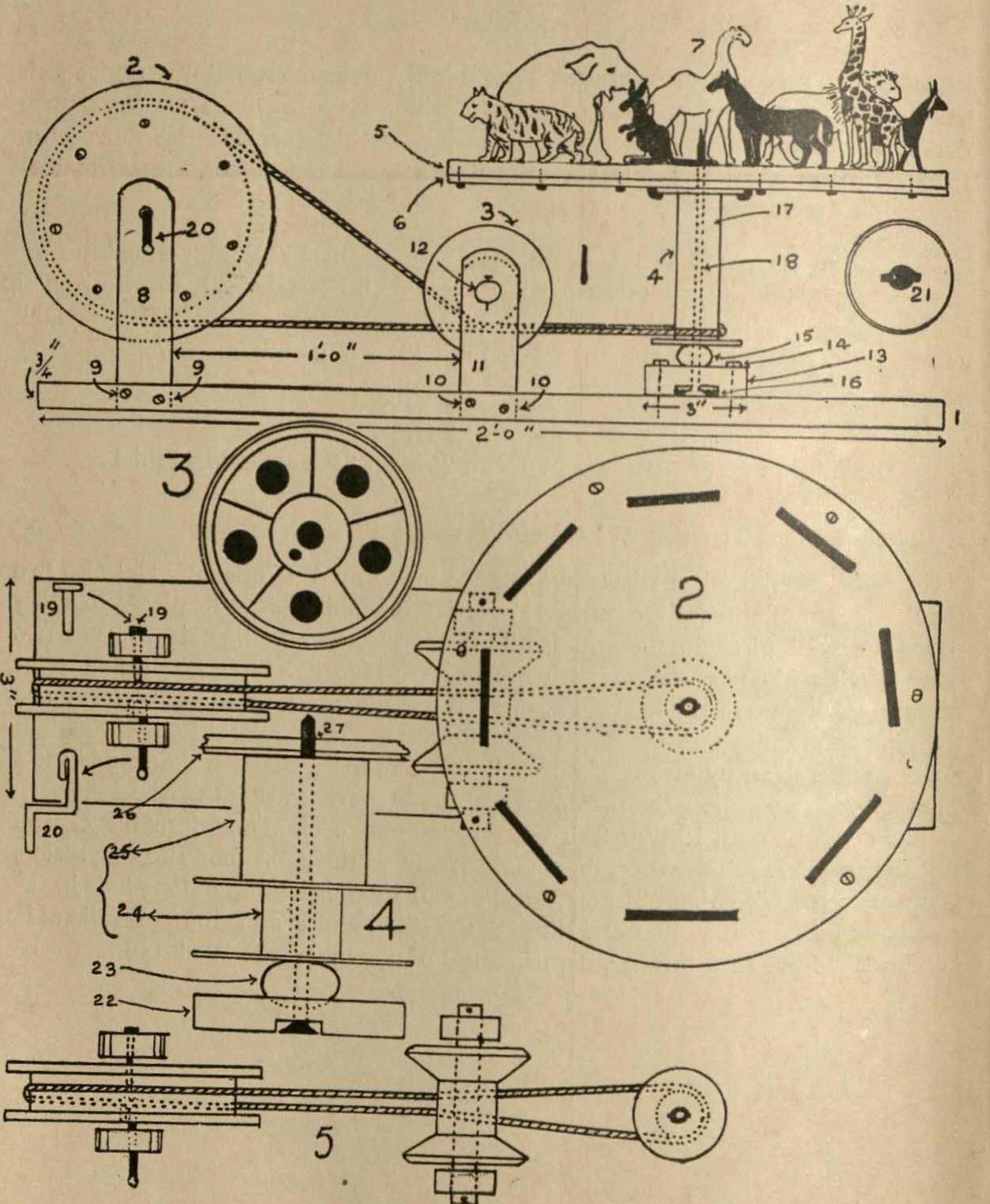
The important parts, FIG. **1** of the toy, are the base (1), the vertical turning wheel with its stand (2), the transmitting wheel with its stand (3), the horizontal moving spool with its minor parts (4), the platform for the animals (5), the plank on which the platform for the animals is fixed (6), and the animals (7).

1. The Base

The base is a piece of wood about 1½′ to 2′ long, 3″ broad and ¾″ thick.

2. The Vertical Turning Wheel and its Stand

Cut one circular piece of wood ½″ thick and about 4″ diameter. Cut also two circular pieces of three-plywood of 4½″ diameter. Nail the three pieces together with the small piece in the middle and the other ones on either side. Take two pieces 4″ × 2″ × ½″ and round off their top ends. Make holes in both at the top for the axles of the vertical wheel. Fix these pieces on the base about 2″ from one end, into slots made in the base for the lower ends of the stand to go through as in 8. Secure them by means of screws 9, 9. The space between the stands must be as much as will allow the turning wheel to move freely. Fix the wheel between the stands with a nail 19, FIG. **2** driven through one of them and into the central hole in the wheel. The wheel must move freely on the nail. For the other side, take a piece of wire about 3″ long, bend one of its ends into an oblong hole in the wheel and pull out the other end through the stand and bend it into a handle as in 20, FIG. **2**. If you turn this handle, the wheel on the other side 19 also turns freely.


3/4"
1'-0"
3"
2'-0"
3"

3. The Transmitting Wheel with Stand

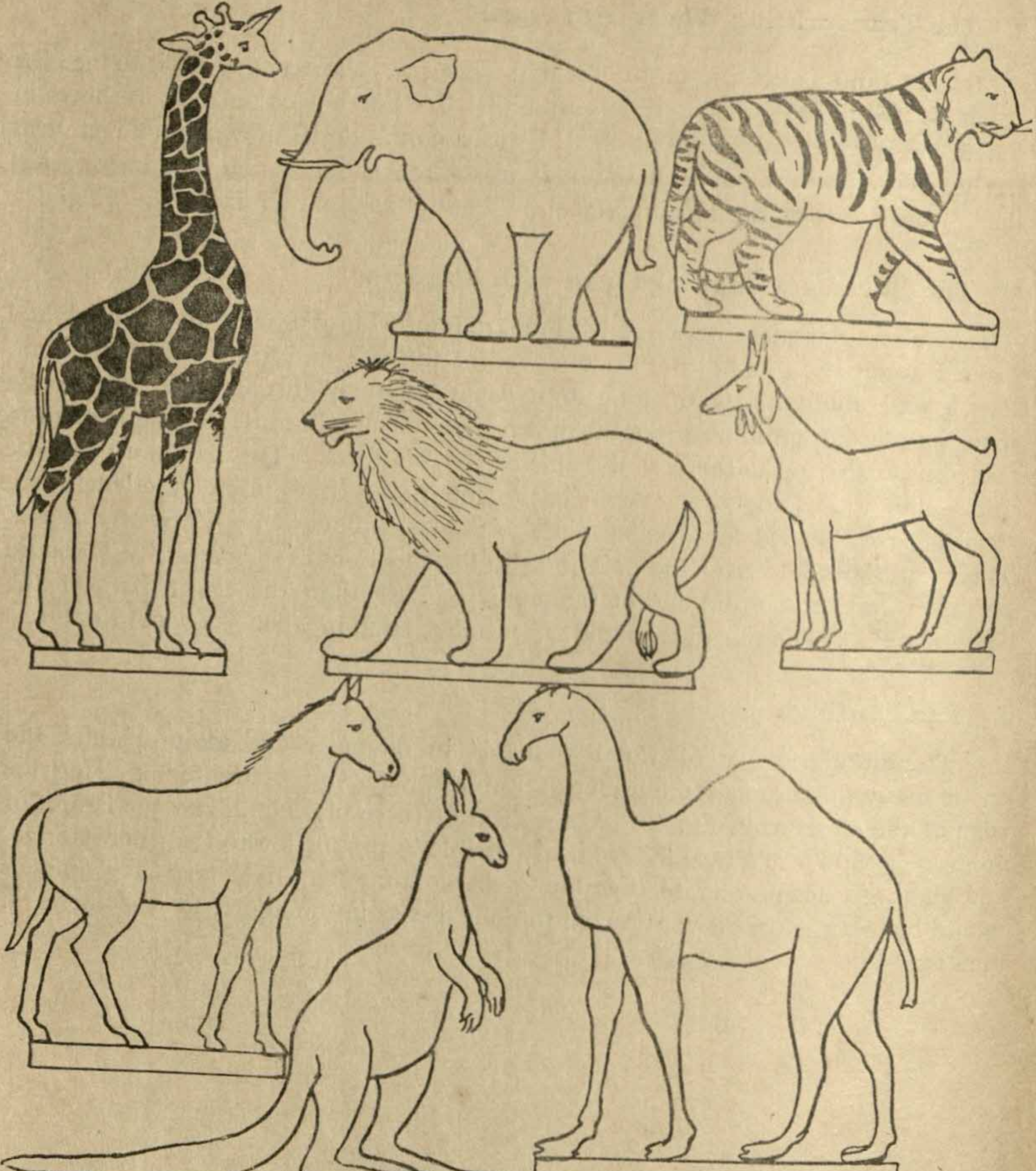
Make a stand as the one on the turning wheel, but shorter, and fix it to the base about 1′ from the other stand with nails 10. Fix a wooden reel as shown in FIG. 5, between the two vertical bars 11 with a cane axle 12 on which the reel turns freely. The bottom curve of the body of the reel should be on the same level as the bottom curve of the turning wheel. The stand should be fixed accordingly.

4. The Horizontal Moving Spool with its parts

Take a circular piece of wood 13, FIG. **1**, about 3″ in diameter and ½″ thick and make a notch 16 at its bottom for the head of the axle nail to be imbedded in it. Pass a nail about 5″ or 6″ long that can pass freely through the hole in the spool—a photographic film spool is shown here. The nail must be long enough to come out at the top to serve as the axle of the platform. The nail must also be thick enough so as not to be caught in the notches on either side of the hole in the spool 21, FIG. **1**. Fix the wooden piece to the base about 3″ or 4″ from the end. Then pass a bead 15 over the nail and slip the spool onto the bead. Care should be taken that the bottom end of the spool is lower than the lower part of the body of reel 3. The bead is intended to reduce friction when the spool rotates.

5. The Platform

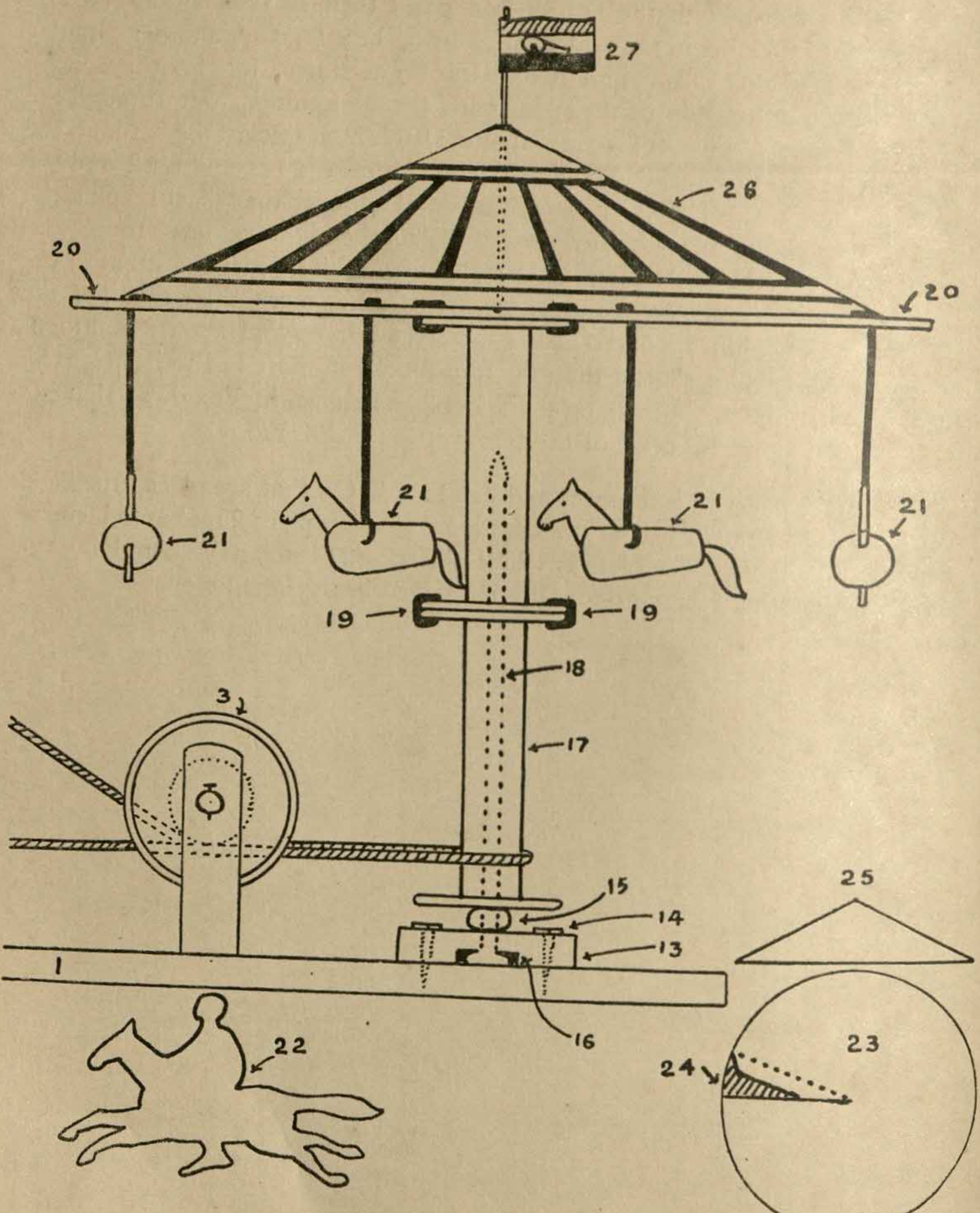
Cut a circular piece of wood about 1′ in diameter and about ⅜″ thick and cut as many notches as the number of animals that you desire to fix along the edge of the circle as in FIG. **2**. On a sheet of three-plywood, draw the figures of animals as shown in **Plate 97** as far as possible in proportion to their normal sizes and so as to accommodate them in a disc of one foot diameter. The animals should have an extra piece attached to their feet as in the figure, to rest them on the disc.



Cut out with a fret-saw all the figures and paint them in their natural colours and fix them into the slits in the platform as in 5, FIG. **1**. Cut another circular disc of plywood 6, FIG. **1**, and nail it onto the underside of the first disc. Slip the whole thing onto the top of the spool with the nail coming out through the centre. Then take a piece of string about 1/10th inch thick, take it round the spool 4, then under the reel 3 and then one end upwards onto wheel 2 and the other end down the wheel. Join the two ends in a knot over the wheel keeping the string tight throughout. If you turn the handle 20, the big wheel turns round and makes the spool turn also. As the diameter of the wheel is greater than that of the spool, the revolutions made by the spool are many times more than those of the wheel. Instead of a film spool, you can use a typewriter spool shown in FIG. **3**. But as the ribbon spool is shorter than the film spool you must add to its height by placing another wooden piece 25 on the spool 24 as shown in FIG. **4**, so that the platform may be above the level of the transmitting reel 3, FIG. **1**.

In FIG. **4**, the support 22 is the same as 13 in FIG. **1**. On that are placed the bead 23, then the ribbon spool 24, next the additional wooden piece 25, so as to increase the height and on these the platform 26 is placed. 27 is the nail. Applying the ame principle, another merry-go-round is explained in the next lesson.

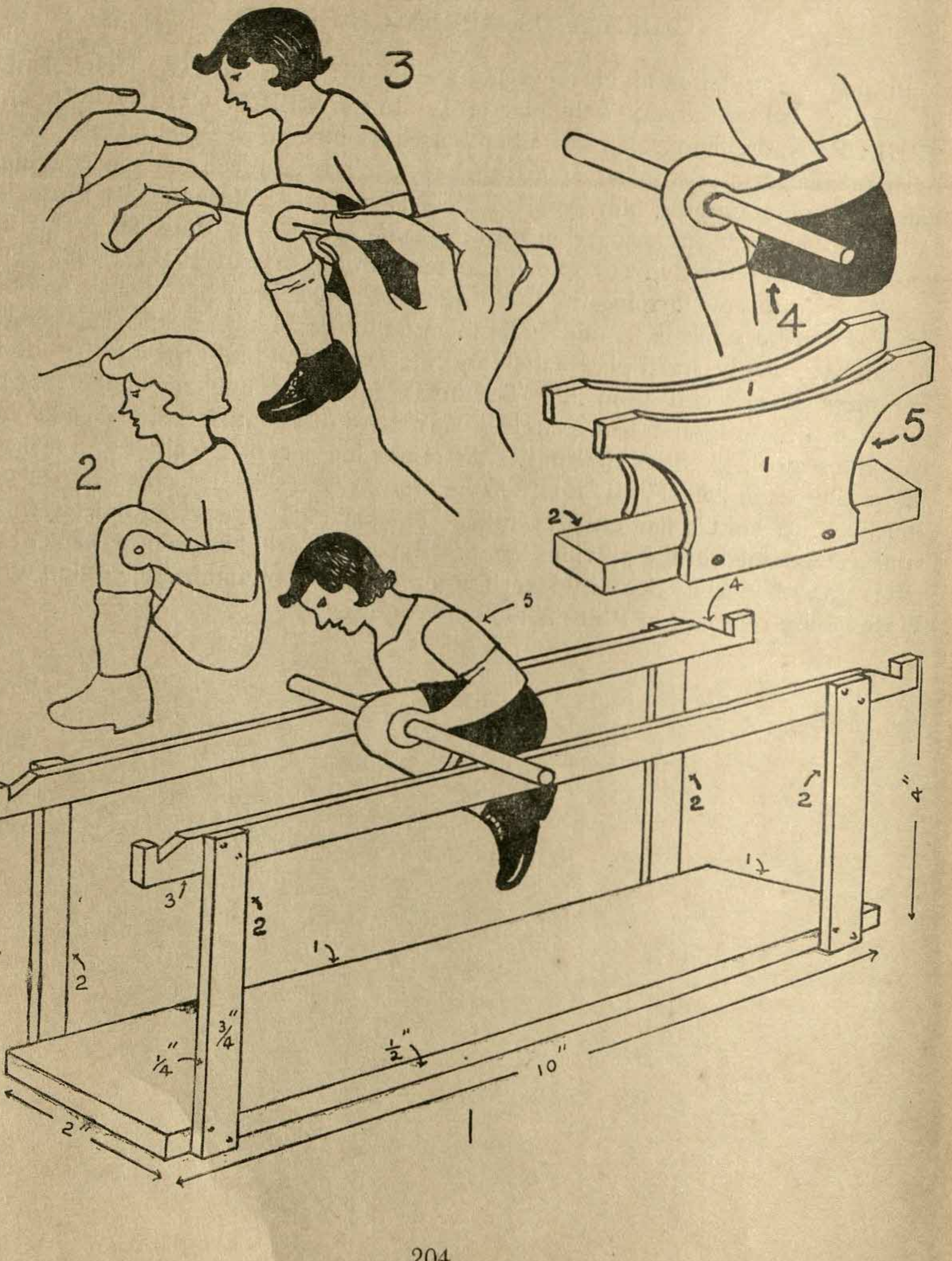
Plate 98



CHILDREN'S MERRY-GO-ROUND

In the previous lesson about the BEASTS ON THE MERRY GO-ROUND the beasts are fixed on the top of the platform. In the MERRY-GO-ROUND FOR CHILDREN, the figures of children on horseback have to be fixed, hanging down from the platform. For this the platform has to be raised. It can be done by adding one more photographic film spool to spool 17 in FIG. **1, Plate 96**. See **Plate 98.** All the other arrangements are exactly the same as shown in **Plate 96**. The two spools should be tightly fixed to one another with bits of wire 19, **Plate 98.** The raised platform now forming the roof is shown in 20, **Plate 98**. Cut out a number of figures of horses as in 21 and hang them on to the platform 20. The figures of children may be small plastic dolls and the horse and the rider may be cut in one piece of plywood as in 22. The horses should be hung from the roof by means of pieces of wire. Cut a circle of cardboard of about 9″ radius as in 23 and cut off a sector 24. Stick the ends of the remaining part of the circle and make it into a cone as in 25. Fix it on top of the roof 20 as in 26. Decorate the cone as you like and hoist a flag on it as in 27. The principle of working the toy is the same as explained in the previous lesson. Experience will help you to correct any errors that may arise. For easy identification of parts, the numbers given in FIG. **1, Plate 96** are repeated in **Plate 98.**

Plate 99



THE ROLLING BOY

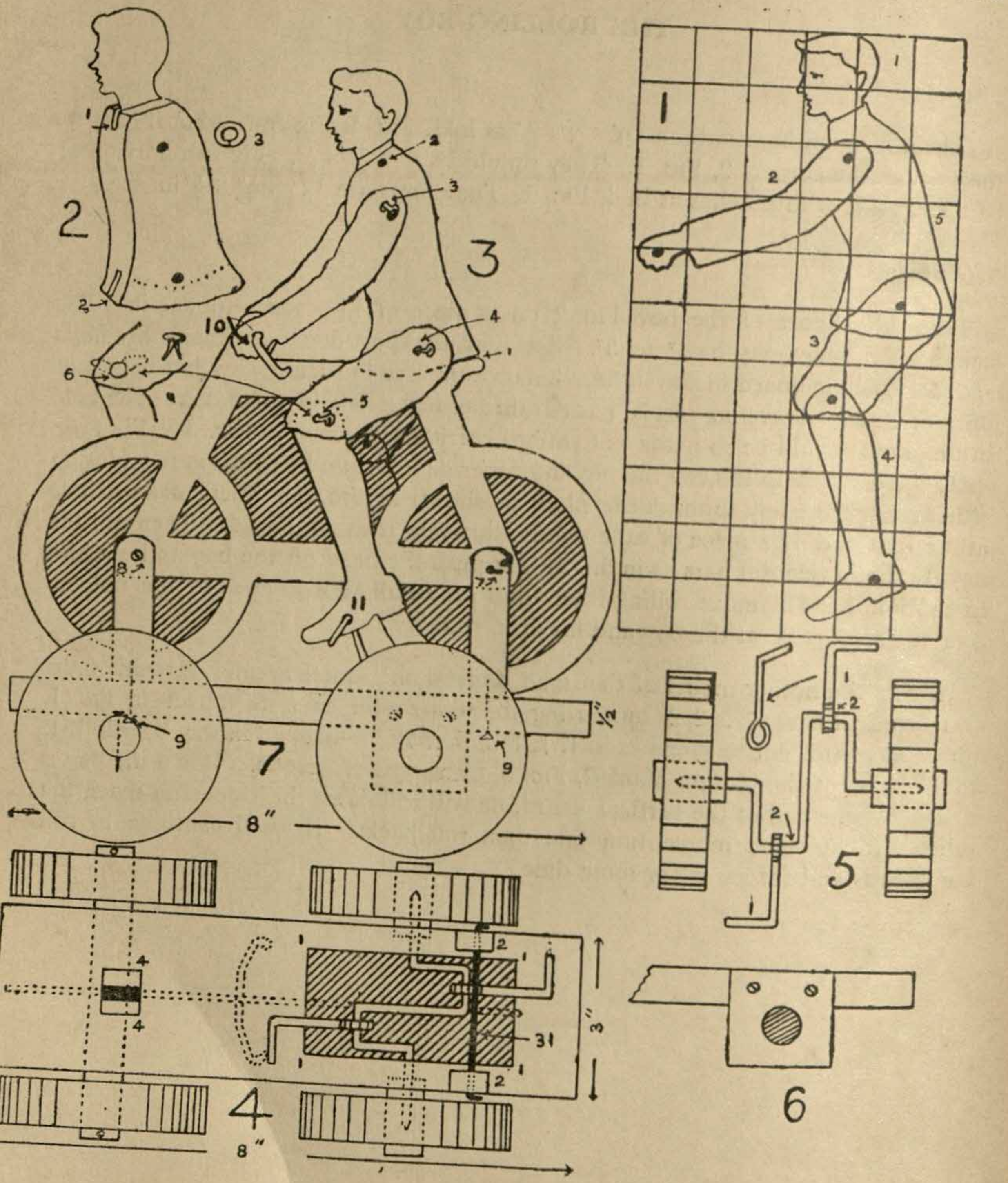
The Stand

Take a wooden board about 10″× 2″× ½″ as in 1, Fig. **1**. Fix four vertical bars to the sides at the corners 2, Fig. **1**. They should be 4″× ¾″ × ¼″. Fix two horizontal bars 3, Fig. **1**, with notches as in 4, Fig. **1**. These bars are 12″ × ½″ × ¼″ in size.

The Boy

Trace the figure of the boy Fig. **2** on a piece of plywood and cut it. The height of the boy may be 4″ to 5″. See that the boy does not knock his head against the base board in the stand. Balance the boy in such a way that he stands upright when the rolling pin is passed through the hole in the hand. The hole in the hand should be so made as to afford correct balance as in Fig. **3**. Find the spot which will help to keep the boy in proper equilibrium by pricking two pins on either side of the boy to mark the place as shown in Fig. **3**. Then make a hole at the spot and fix a piece of cane tightly through it as in Fig. **4**. Then put the boy on the horizontal bars as in 5. If you push the head of the boy and set him in motion, he will move rolling round and round till he is stopped in the notches 3 or 4, Fig. **1**. Paint the boy and his dress suitably.

In Fig. 5, another model of the stand is given on a smaller scale. Instead of the four vertical bars 2, 2, 2, 2 supporting the horizontal bars as shown in Fig. 1, plywood boards cut to shape as in 1, 1, Fig. 5, may be used. Fix the boards 1, 1, to the sides of the bottom plank 2, Fig. **5**, by means of screws. When the boy is placed at one end of the vertical board, he will roll down the slope and reach the other end by sheer momentum and then roll back. He will continue to roll backwards and forwards for some time.


1/2"
8"
3"
8"

THE CYCLIST

This toy is made of three-plywood and some soft wood ½″ thick.

The Rider

First draw the figure of the man as in Fig. **1**. The squares are intended to help you to draw the figure to any required size. The head, two hands, two thighs and two knees 1, 2, 3, 4, Fig. **1** are to be cut in three-plywood. The body 5, Fig. **1**, is to be cut in ½″ thick soft wood. Cut two slits at the top and bottom of the body as in 1 and 2, Fig. **2**. The head is fixed into the top slit as in 1, Fig. **2**. The bottom slit is intended to fix the body on the seat of the cycle as in 1, Fig. **3**. Make holes for the shoulders, hands, hip, knees, and feet as shown by the big dots. Make four washers or small rings with wire as in 3, Fig. **2**. Fix the several parts of the body as shown in Fig. **1**. Fix the head into the trunk by a small nail 2, Fig. **3**. Take a piece of wire and pass it through one arm, a washer, the trunk and again a washer and through the other arm, and bend the ends of the wire into rings as in 3, Fig. **3**. Take another piece of wire, pass it through one thigh, a washer, the trunk, another washer, and the other thigh and secure the thighs to the trunk by bending the ends of the wire into rings as in 4, Fig. **3**. Take two more pieces of wire and fix the knees on the inside of the thighs as in 5, Fig. **3**. This may also be done with paper-fasteners by making bigger holes to allow freer movement of the knee-joint as in 6, Fig. **3**.

The Bicycle

Take a piece of three-plywood and cut out of it the whole bicycle as shown in Fig. **3**. The height of the machine should be equal to the length of the leg and the thigh in suitable proportion.

The Platform on Wheels

Take a piece of wood ½″ thick, a little longer than the bicycle, and suitably broad (about 8″× 3″× ½″). The dimensions marked in the drawing are only approximate, but in actual working you will be able to know the exact requirements of size etc. Make four wheels, ½″ thick, with holes for the axles. The front pair of wheels are to be fitted on a single axle of cane or bamboo on which they should rotate freely. The two back wheels are to be fitted to two bits of cane or bamboo in a rigid manner so that the axle and wheel turn together. Take a piece of wire and bend it to shape as shown in Fig. **5** and fix its ends tightly into the two wheels as shown. Make a rectangular opening 1, 1, 1, 1, Fig. **4**. in the platform for the free movement of the mechanism of the back wheels. Fix two upright pieces of section of half inch square into the platform on either side of the opening by nailing from underneath as in 2, 2, Fig. **4** and 9, Fig. **3**. These will support the bicycle on a piece of wire 3, Fig. **4** passed through the holes at the top as in 7, Fig. **3**. Fix two upright pieces of the same dimensions for the front wheel as in 4, 4, Fig. **4** but closer than 2, 2, with a nail as in 9, Fig. **3**. The front wheel of the machine is fixed to the top of these upright pieces at 8, Fig. **3**. As the front wheels can turn round the axle freely, the axle may be fixed to the underside of the platform by means of nails. To fix the back wheels to the platform take two pieces of plywood with holes big enough to allow free rotation of the axle and fix them on either side of the platform as shown in Fig. **6** after passing the axles through the holes.

Assembling the Model

After fixing the upright pieces on the platform and wheels underneath as in 7, 8, Fig. **3** test the bicycle on them and then fix the rider on the cycle as in Fig. **1**. Pass a bit of thick wire to serve as the handle-bar through the holes of the hands and the machine as in 10, Fig. **3**. Then fix one of the pieces marked 1, 1 in Fig. **5** through the hole of one foot and the other one through the other foot as in 11 in Fig. **3**. While the platform is drawn forward, the bends marked 2, 2 in Fig. **5** go up and down alternately thus taking the legs also up and down. This gives a realistic appearance of a cyclist pedalling.

THE AEROPLANE

This is another interesting toy. If the flying plane is put at the top of a helix it comes down winding. A helix is a spiral curve formed by a thin piece of wire coiled round a thick central piece of wire as in FIG. **5**.

The Helix

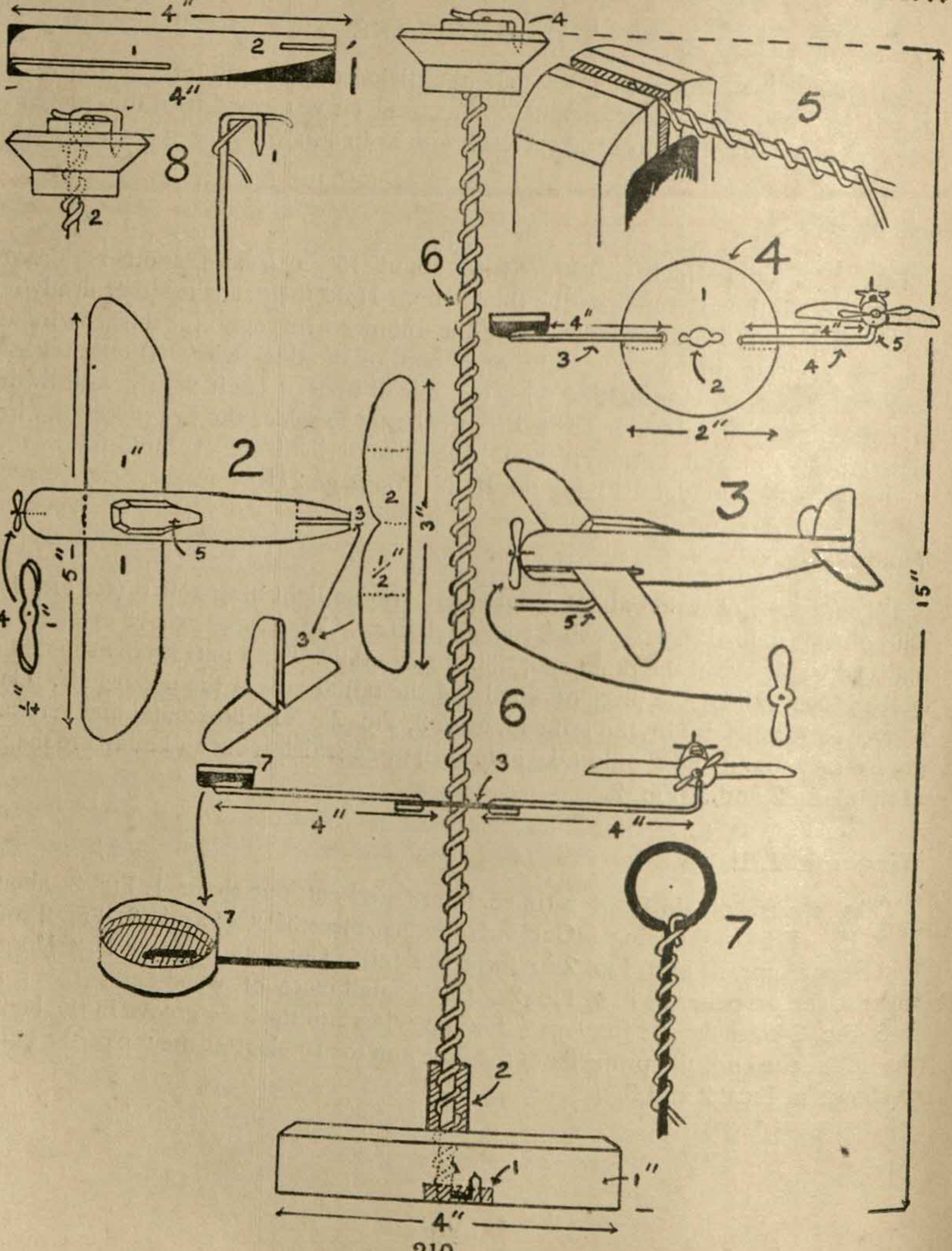
Take a straight thick piece of wire about 15″ long and another thinner wire, about 2½ times as long as the thick wire. Hold their ends together firmly in a vice as in FIG. **5** and go on twisting the thinner wire round the thicker wire at regular intervals till you reach the other end of the thick wire. Do not release your hold, as otherwise the thin wire will uncoil itself. Tie it tightly with twine at both ends till the work is finished. It is better to solder the two pieces of wire both at the top and bottom if you have a soldering iron. If not, follow the method explained under "Fixing the Helix" on page 211.

The Plane

Take a piece of wood about 4″ long, cut from a light map roller (see FIG. **1**). Cut off the shaded portion with a sharp knife. Cut a long groove at one end and a short groove at the other end, both horizontally. The longer groove should be in the lower half of the piece of wood and the tail groove in the upper half. Cut a vertical groove also in the tail end, as in 3, FIG. **2**. The horizontal and vertical grooves at the tail end should take in the tail piece which is cut and folded to shape as shown in 2 and 3, FIG. **2**.

Wing and Tail

Take a piece of tin from a tin container and cut out shape 1, FIG **2**, about 5″ × 1″. This is the wing. Cut out another piece 3″ × ½″ as in 2, FIG. **2** and fold it to shape as in 3, FIG. **2** to form the tail. Cut a third piece 1″ × ¼″ and make it the propeller as in 4, FIG. **2**. Cut a small piece of wood and shape it as in 5, FIG. **2** to make the fuselage. Fix the wing into the long groove in the body, the tail at the end, the propeller at the nose and the fuselage at the top of the body as shown in FIGS. **2** and **3**.

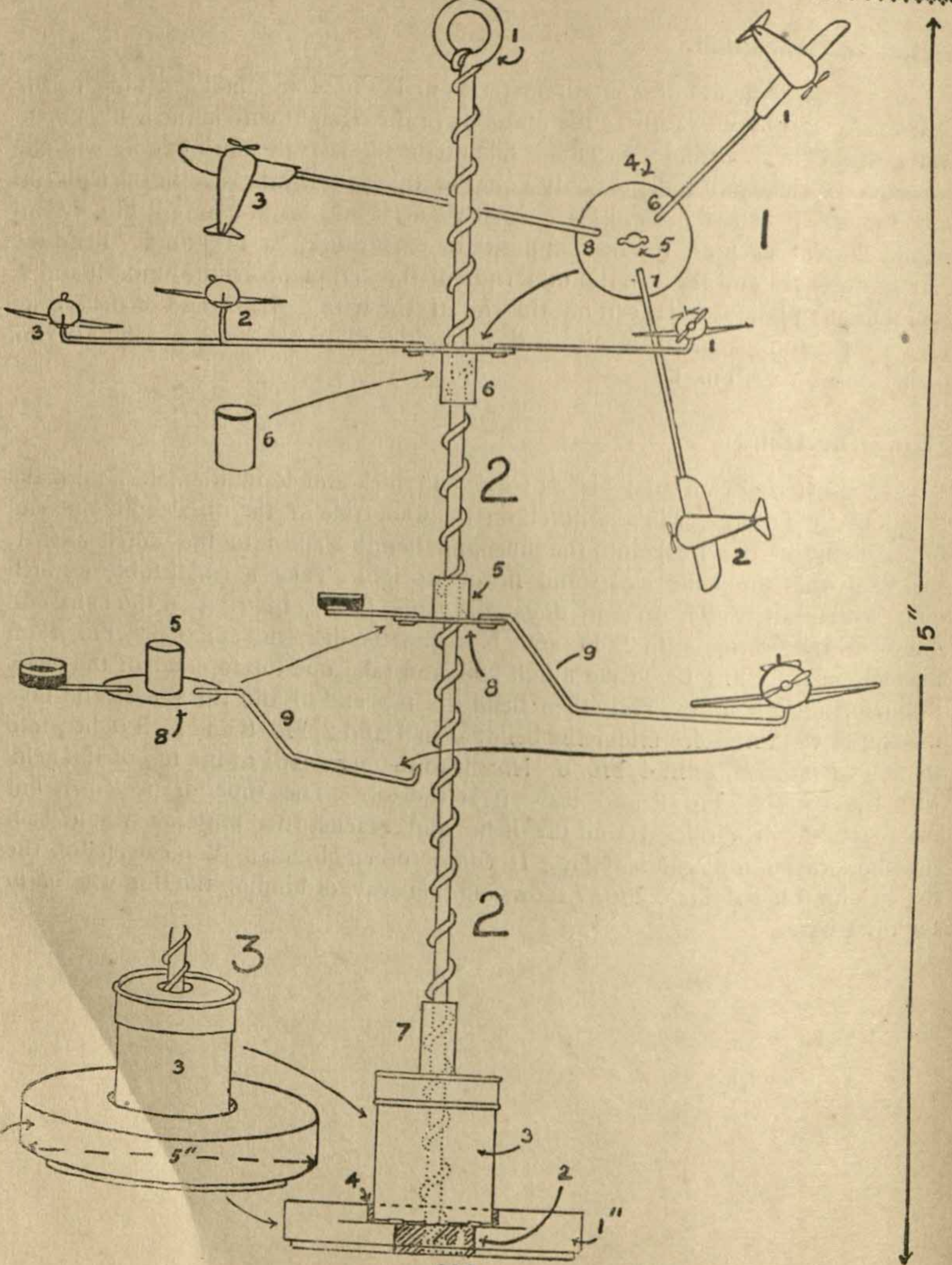

4"
4"
4"
4"
2"
1"
5"
1"
¼"
3"
½"
15"
4"
4"
1"
4"

Fixing the Aeroplane

Cut a disc of tin about 2″ in diameter as in 1, FIG. **4** and make a hole in the centre as in 2, FIG. **4** exactly of the diameter of the straight wire in the helix, FIG. **6**. Make also two small holes on either side of the big hole in continuation with the diameter of the small holes exactly equal to that of the thin wire in the helix, as in 2, FIG. **4**. Take two pieces of wire each about 4″ long as in 3 and 4, FIG. **4**, and fix one end of each on the disc, opposite to each other, as in FIG. **4**. Bend the end of one wire and fix it to the underside of the aeroplane as in 5, FIGS. **3** and **4**. See that the plane is balanced on the end of the wire. At the end of the second wire 3, FIG. **4** fix a small tin disc with enough lead to balance the weight of the plane. See also 7, FIG. **6**.

Fixing the Helix

Take a square or circular piece of wood 1″ thick and 4″ in diameter and make a hole in the centre. Make a notch on the underside of the piece. Fix one end of the helix (both wires) into the hole and bend its end into the notch as in 1, FIG. **6**, so that the helix can stand firmly upright. Take a small tube, an inch long, which can move up and down the helix freely, insert it on the helix and drop it to the bottom as in 2, FIG. **6**. Next put the disc with the plane, FIG. **4**, on the helix as in 3, FIG. **6**. Take a half reel and take out the top end of the helix through the hole in the reel, then bend the top end of the thick wire and take the end of the thin wire under the bend, as in 1 and 2, FIG. **8** and fix it tightly into the top of the reel, as in 4, FIG. **6**. Now lead the aeroplane to the top of the helix with the tube 2, FIG. **6** and leave it at the top. The tube drops down but the plane slowly circles round the helix and reaches the bottom. Again lead the plane to the top and leave it. It comes down circling. You can paint the toy in suitable colours. FIG. **7** shows another way of binding the thin wire on to the thick wire.


1"
5"
1"
15"

CHASING BOMBERS

This toy is made and worked much in the same way as the single plane explained in the previous lesson. But in this toy there are three small bombers chasing a plane below.

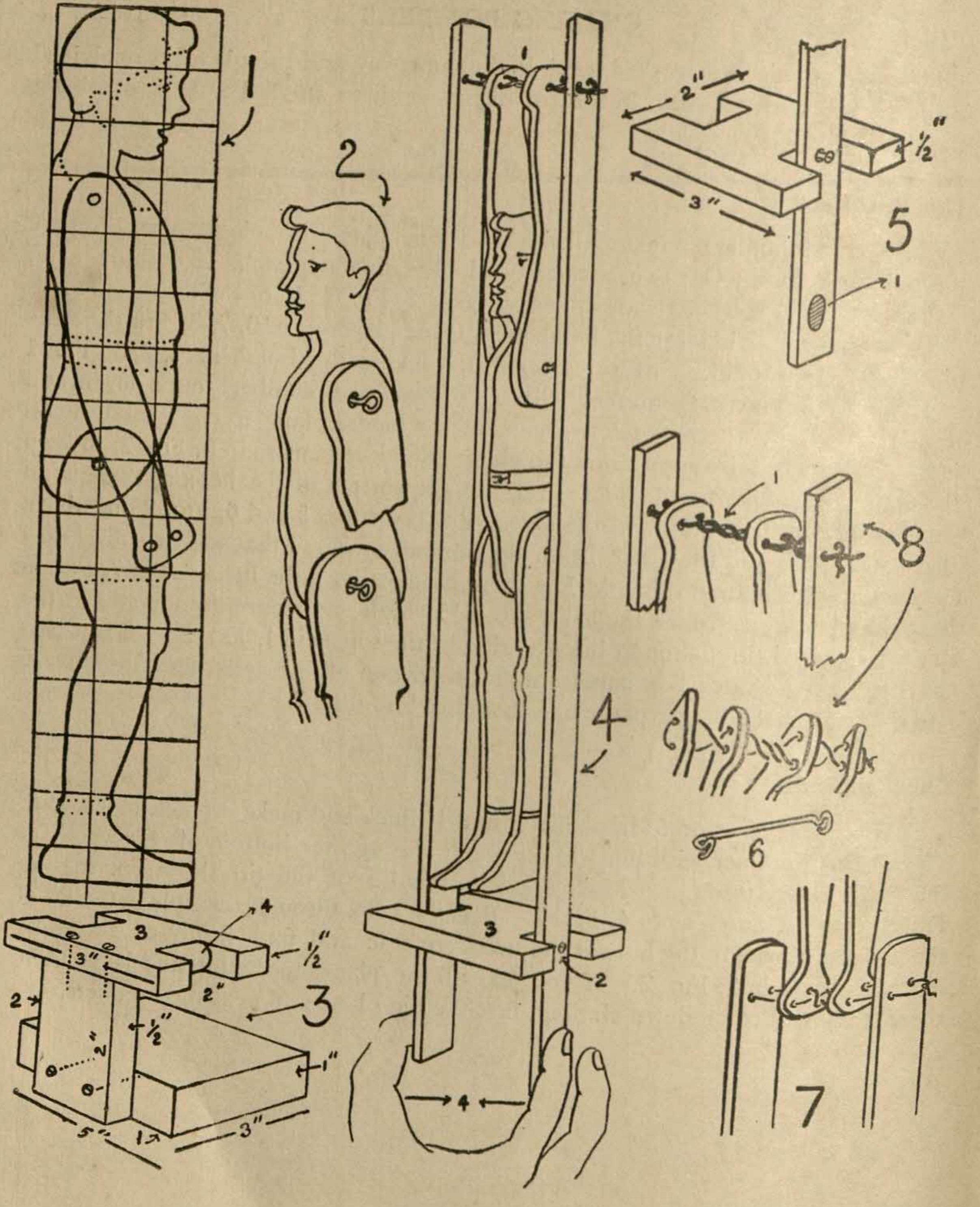
The Bombers

Make three bombers of small size and one plane of bigger size. Prepare the helix as before. Cut two discs of two inches diameter each. In both of them, make the central holes as for the other toy, as in 5, FIG. **1.** In one of the discs FIG **1,** fix the supporting wires for the bombers in three places as in 6, 7, 8, FIG. **1.** The pieces of wire should be of three lengths, to keep the bombers 1, 2, 3, FIG **1** at different distances from the helix. To keep the bombers on a level, add some lead weight wherever necessary. Fix the bigger plane to the second disc as in 8, FIG. **2** The wire supporting the plane should be bent as in 9, FIG. **2,** to keep the plane near the ground when it reaches the bottom of the helix as there is an elevated platform 4, FIG. **2,** at the base. Put two tubes 5 and 6, FIG. **2** one above the lower plane and the other below the bomber's disc, so that the two discs may have some gap between them. Let there be another tube below as in 7, FIG. **2,** near the platform. Make the helix about 15″ high and secure the top end of the thin wire by twisting it round into the ring at the top as in 1, FIG **2.** Then pass the disc with the three bombers from the lower end of the helix, then the tubes 5 and 6 and next the bigger plane and then the third tube 7.

The Platform

Take a piece of wood 5″ in diameter and 1″ thick and make a notch in it to hold a small tin container with lid. Make a hole through the bottom of the wood for the helix to go through. Make a hole in the lid of the tin also. Fix the tin, FIG **3,** into the notch as in 4, FIG **2.** Pass the helix through the hole in the lid of the tin and through the hole at the wooden base and fix it firmly as shown by dotted lines as in 2, FIG. **2.** If you take all the planes to the top and leave them there, they will come down circling, first the big plane and next the bombers.

Plate 103

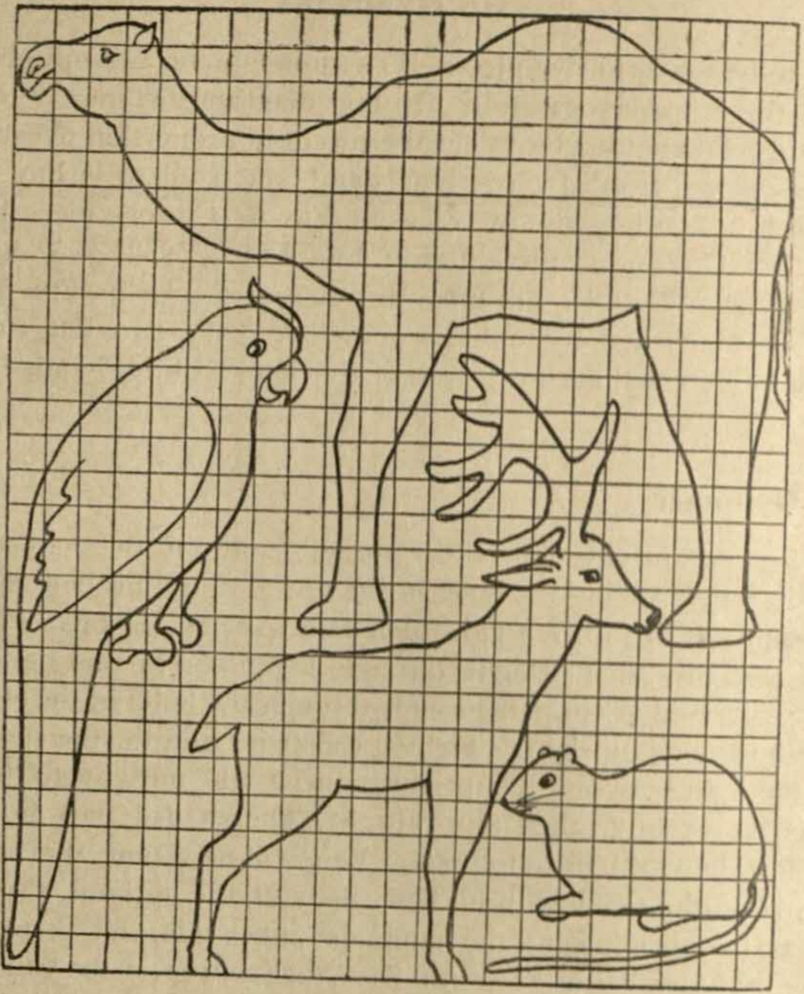


THE GYMNAST

This toy is to be made in five pieces. We require a man, two uprights and a platform. Study the drawings carefully. In the diagram the man is drawn within squares and this will enable you to cut the pieces in proportion to each other. Cut from three-ply wood, two legs, two hands and one trunk as in FIG **1**. Fix them together as in FIG. **2** using wire pieces as in FIG. **6**. Cut one piece 1 as in FIG. **3** of size 5″ × 3″ × 1″, another piece 2 as in FIG. **3** of 2″ × 2″ × ½″ and a third 3, as in FIG. **3** of 3″ × 2″ × ½″. Fix them together as shown in FIG. **3** by means of screws. The parts marked 4 should be rounded. Take two long strips of wood which should be longer than the length of the man with his hands fully raised as in FIG. **4**.

Fixing the Gymnast

First lay the two uprights flat on the ground, and put the man stretched, with the holes in his hands facing the holes in the uprights and his body stretched away from the uprights as in FIG. **7**. Take some strong twine, pass its ends through the holes in one upright, then straight through the holes in one hand. Give two twists to the twine and again pass its ends through the holes in the other hand and the holes in the second upright. Tighten the twine and tie the ends into a knot. After tying the man between the upright strips, fix the uprights to the platform 3, FIG. **4** by screws as in 2. See also FIG. **5**. The shaded part in FIG. **5** shows the place where you will have to press. You will now note that when the man hangs down from the twine with his body between the uprights, there is one twist each between the uprights and the hands on either side and there will be three twists between the two hands as in FIG. **8**. When you press the two lower ends of the uprights, as shown in 4, FIG. **4** the gymnast will perform somersaults. The toy should be painted in suitable oil or water colours to give it a realistic appearance.



SOFT TOYS

Making soft toys is an interesting and profitable hobby. The toys are easy to make and are full of promise to the toy-maker.

The Materials

The materials used are felt or cotton cloth; velvet; sateen; fur cloth for casing; cotton; silk-cotton; wood-wool; cotton waste; sawdust; rags; straw etc., for stuffing; wire for giving support to toys with long slim limbs, claws and neck; glass beads for eyes; cotton or hemp twine; threads of different colours for stitching etc.

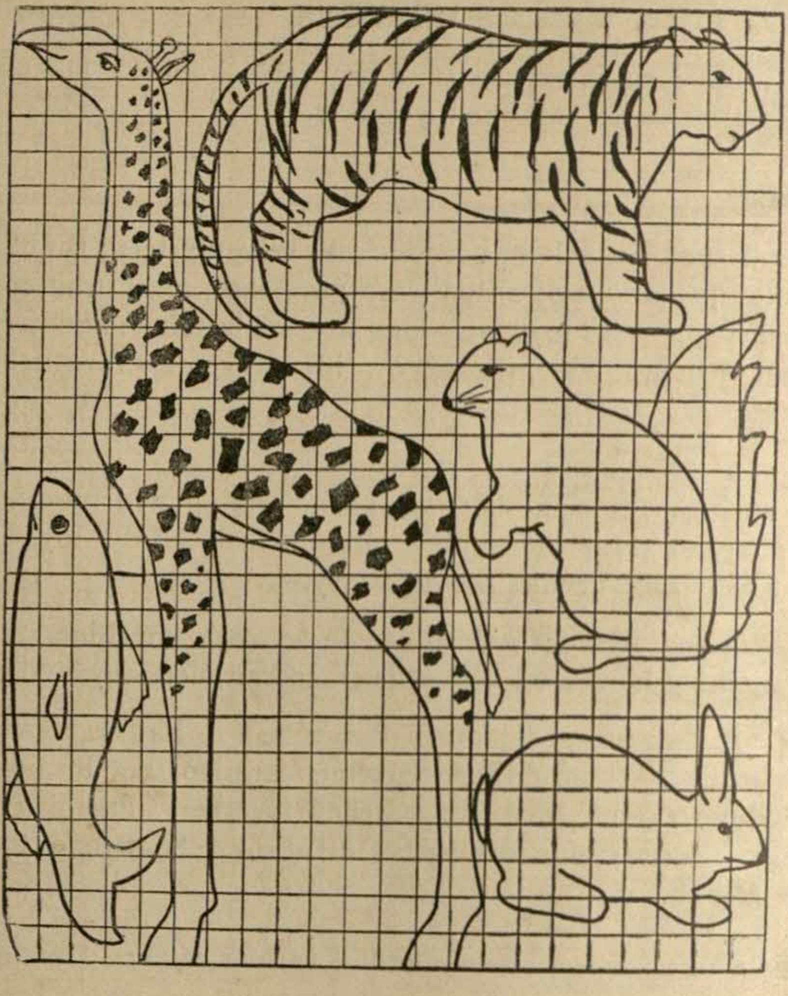
Tools

Some tools such as a cutting-plier with round and pointed nose, a piece of stick with a forked end to push the stuffing into the body of the toy, long and short needles as well as curved needles are necessary.

Wherever long and straight stitches are to be made, machine stitching may be had. Hand stitching however is the easiest and can meet any kind of need.

Toys may be in the natural colours of the animals or birds represented or in any colours you wish. When different colours are to be introduced, bits of materials of those colours may be stitched together. Planning and previous arrangement are necessary for making beautiful toys. Sometimes the toys may be painted, if so desired.

It will be helpful to collect bits of cloth of various colours from a tailor's shop.



Before a toy is made, its size should be determined first for getting the materials ready. Drawings of the required size are to be drawn first. If drawings of the desired size are not available, trace small drawings on squared paper as in **Plates 104** and **105**. These can be enlarged on a paper with one inch, three-quarters of an inch or half-inch squares according to the size of the toy that you propose to make.

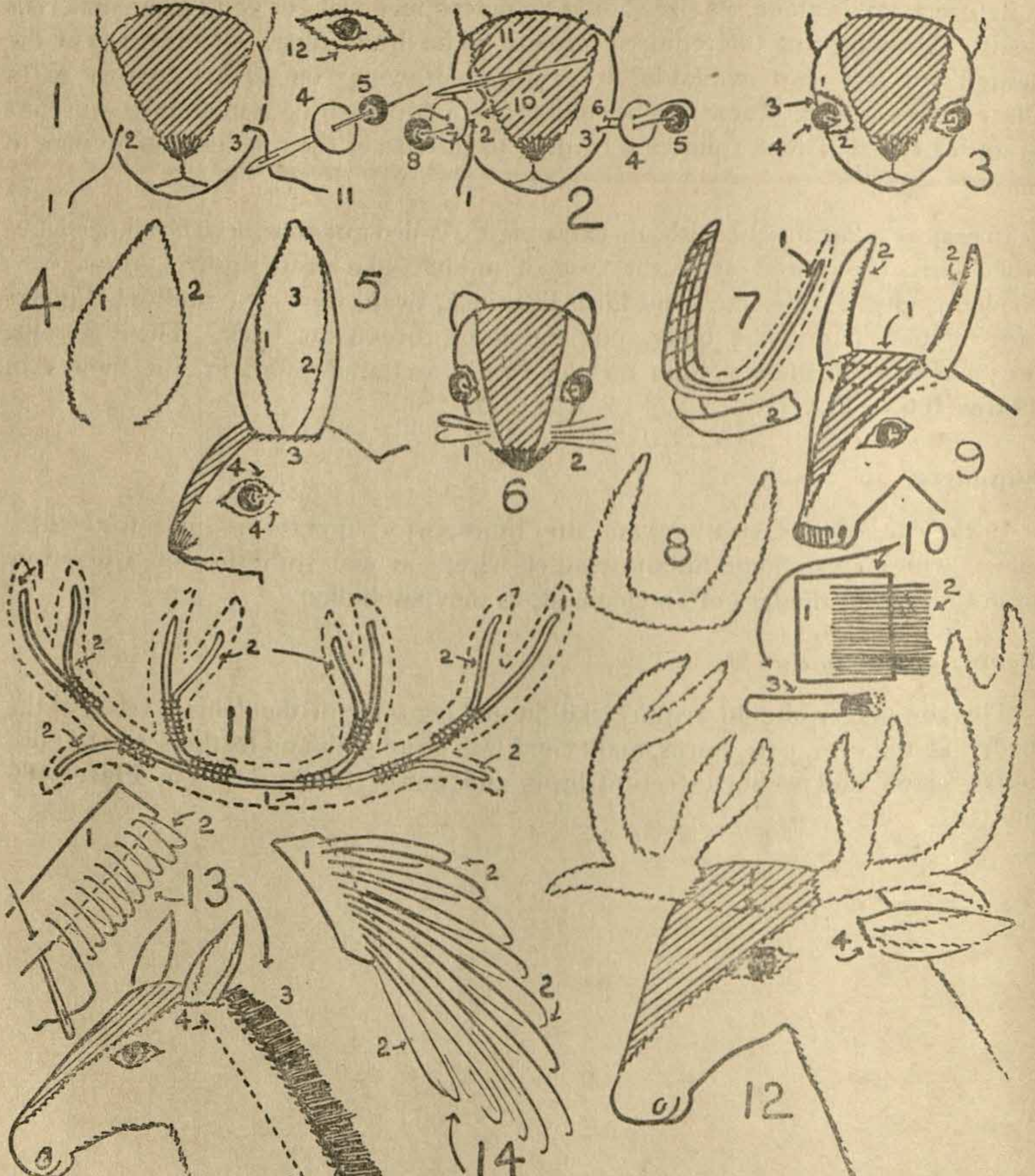
In easy and flat toys like fish, no extra pieces, called **gussets,** need be stitched, but when bulk is required as in the case of animals like a rat, squirrel, horse, cow, elephant, giraffe, tiger etc., and birds like duck, swan, fowl etc., additional pieces are stitched under the body, on the head, or on the back. These gussets, are shown with shaded lines on the heads and undersides in the figures in **Plates 106** to **122.**

Supports

In the case of toys with long and slim limbs, wire supports are put into the legs, claws, wings etc. Sometimes instead of wire, you may stuff the toy with straw as in the case of the legs of an elephant, as they are bulky.

Parts of the body

The toy-maker should acquire skill in making some of the delicate parts of the body like the eyes, ears, horns, manes and tails of animals and feathers, wings, tails, beaks, claws and webbed feet of birds and fins of fish as shown in **Plates 106** and **107.**



Eyes

Colour beads are stitched into the head for eyes. The beads should have white bits of cloth for the background to show the white of the eye. Take two black or blue beads and stitch them on to two bigger pieces of white cloth. Make slits in the head on either side of the nose, insert the white pieces of cloth with beads one into each slit. Stitch the edges of the slits to the white cloth as in 12, FIG. **1.**, **Plate 106**. The eyes are to be fixed after the head is stuffed.

Eyes can be fixed in another way. Use strong twine for this purpose. Pass the needle with strong twine 1, FIG. **1** through 2, take out at 3, pass it through the white cloth 4, and bead 5. Pass the twine in the reverse direction through 6, FIG. **2**, take it out at 2, and again pass it through a white piece 7 and bead 8, FIG. **2** and tie both ends of the twine 1 and 11 very tightly close to the head. The eyes will be firmly imbedded in the head as in FIG. **3**. The eyelids, as fixed into the head, are shown in 4, 4, FIG. **5**. Stitch the white bits of cloth to the head.

Ears

Take two bits of cloth, of the same colour as the body, cut them to shape as in FIG. **4**. Cut two bits of white cloth of the same shape and size. Put one colour bit and one white bit together and stitch the edges as in 1 and 2, FIG. **4**. Fold the lower ends of the edges a little inwards as in 1 and 2, FIG. **5**. Insert the ear into the slit 3 and stitch. If the ears are to stand erect and stiff like those of the rabbit, you should stuff them with a thin layer of cotton or insert a piece of card between the two pieces.

Whiskers

Stitch two or three loops of twine into the head above the nose as in 1, FIG. **6** and cut the ends as in 2, FIG **6**.

Horns

Take a piece of wire and bend it into shape as in 1, FIG. **7**. Wind bits of cloth 2 round the wire, cover all the bits with a single piece of cloth and finish as in FIG. **8**. Fix the horns 2-2 in position under the head gusset 1, FIG. **9**. Horns for a giraffe are made as in FIG. **10**. Take a bit of brown cloth or felt as in 1, set on it a number of woollen bits as in 2, and roll them all as in 3. Make two like this and fix them as the horns of the giraffe.

Horns of an Antelope

Take a long piece of wire suitable to the size of the toy as in 1, FIG. **11**. Tie small bits of wire as in 2 by means of binding wire to show the branches of the horn. Cover the whole frame with rags to the thickness shown by the dotted lines. Place the frame on cloth and cut two pieces of the shape shown by the dotted lines. Stitch the edges of the cloth encasing the frame. Fix it on the head of the antelope in position under the head gusset as in 1 and 2, FIG. **12.** 4 is the position of the ear.

The Mane

The mane is made of wool. Take plenty of wool and make three or four rows of loops as in 2, FIG. **13** along one edge of a strip of thick cloth as in 1. Cut the loops into singles as in 3. Put the strip of cloth between the two neck-pieces with its plain edge 4-4 well inside and stitch the whole thing along the border.

The Bushy Tail

Take a bit of cloth, 1, FIG. **14**, and stitch a number of rows of long and short loops 2-2 2. Cut the loops into singles to form a bunch of hairs like the tail of a horse. Insert the cloth pieces 1 between the two side-pieces of the body and stitch them all together as in the case of the mane.

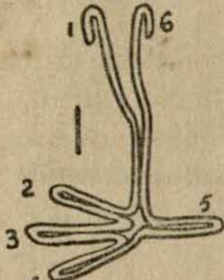
Claws of Birds

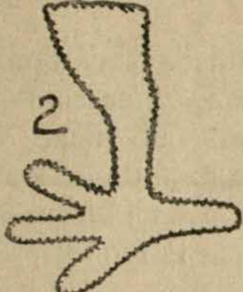
When you make toys of birds you should try to make them stand on their legs and claws. The legs and claws are very thin when compared to the weight of the body. So you have to introduce wire supports into them. The claws are differently arranged in different birds. Some birds have three claws in front and one at the back as in FIG. **2**. The parrot has two claws in front and two at the back as in FIG. **4**. The claws of a duck are webbed, as in FIG. **3**.

Take a long piece of wire and bend its ends as in 1 and 6, FIG. **1**. The remaining portion of the wire is folded into the three front claws as in 2-3-4 and one into the back claw as in 5. Cut two pieces of cloth or felt suited to the bird as in FIG **2**. Stitch the edges of the front claws, insert the wire claws into the cloth and stuff all round the wire with the help of a stick. Stitch the cloth round the fourth claw after stuffing it also. The vertical part of the legs are also stitched and stuffed. When the body of the bird is made, the two legs are inserted into it in proper position as in 8-9, FIG. **8** and stitched tightly. See that the claws are long enough to balance the weight of the body evenly as in FIG **8**. This can be learnt by experience. If necessary, the whole bird may be fixed on to a piece of plywood.

Webbed Feet

In making the webbed feet, FIG. **3**, the shaded portions 1 and 2 also form part of the claws, and pieces of cloth are cut suitably. The shaded parts are first stitched to exclude them from the parts that are to encase the claws. There is no fourth claw. In the parrot's claws, FIG. **4**, the claw 4 in FIG. **1** is bent backward towards 5.

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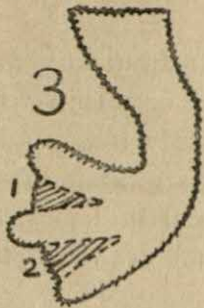

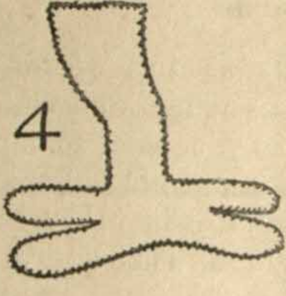
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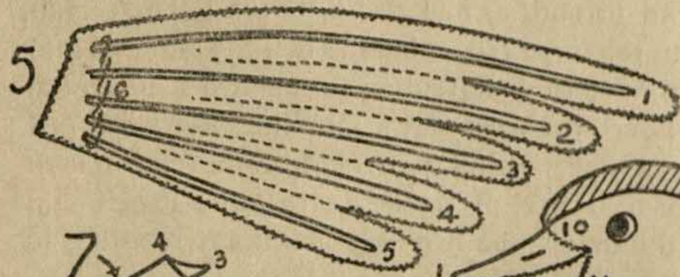
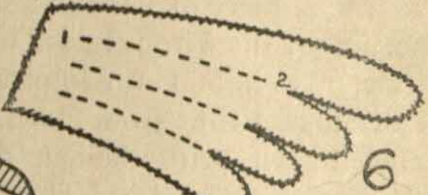
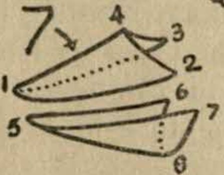
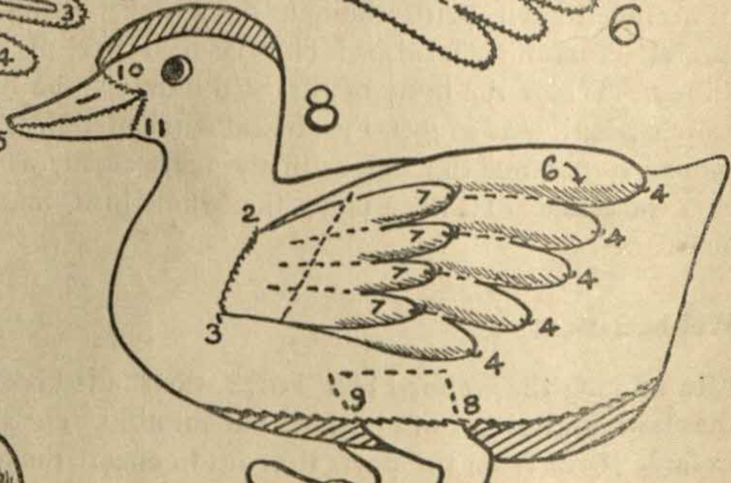
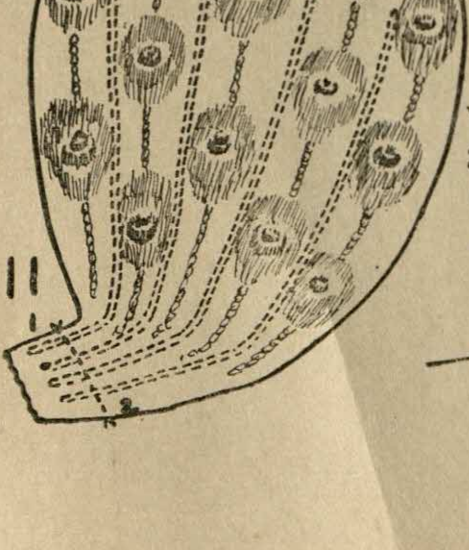
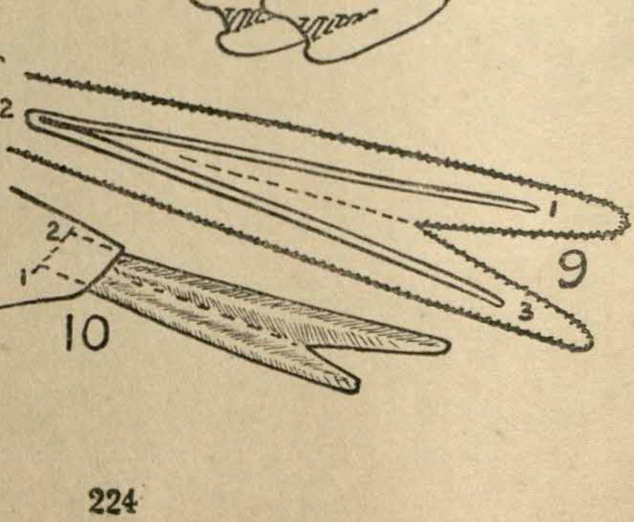












Wings

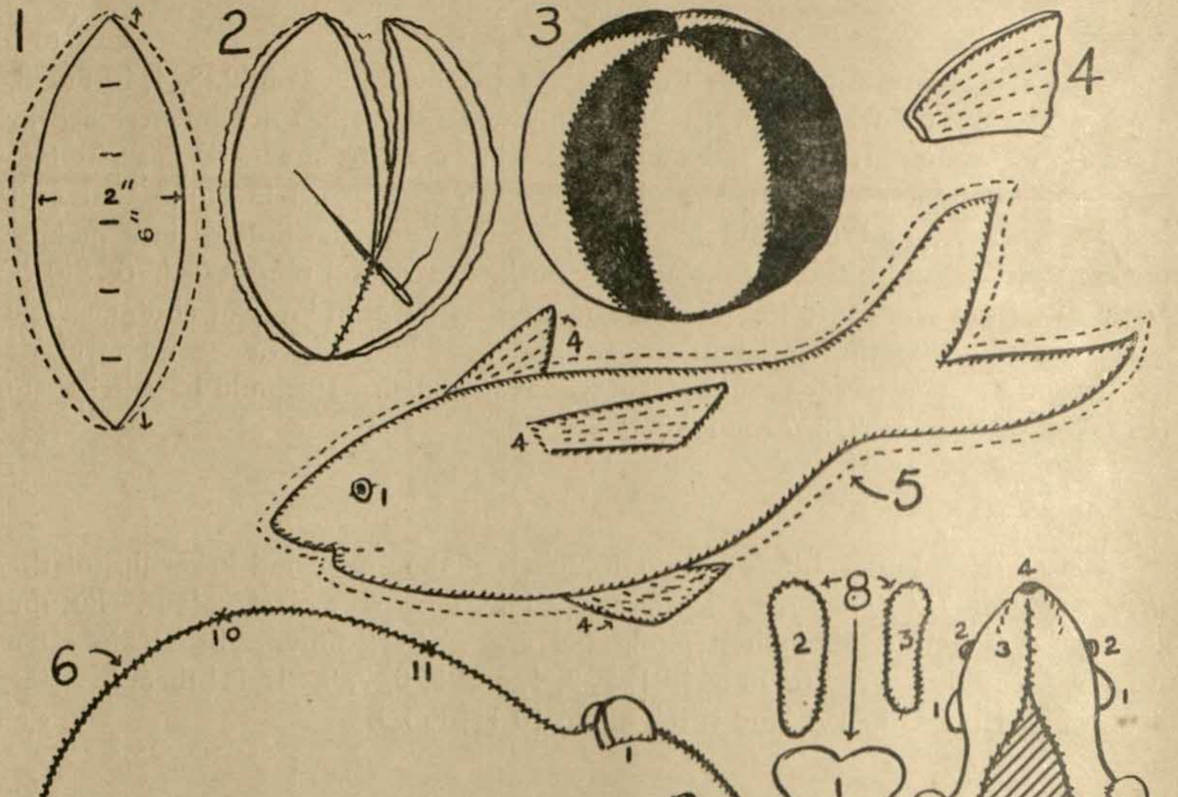
If the wings are stitched on to the sides of the body as in 2, 3, 4, in FIG. **8**, there is no need for wire supports. It is only when the wings are outstretched or when they stand apart from the body that wire supports are needed as in 1 to 5, FIG. **5**. For each wing, cut two pieces of cloth of shape as in FIG. **5**, with four or five feathers, and then stitch along the edges and the dotted lines making pockets for the wire bits. Make a framework of wire and bind it as in 6, FIG. **5**. Insert the framework into the pockets and stuff with a thin layer of cotton. The wire bits must be imbedded in the stuffing. If you want a second layer of feathers, the second layer should be shorter as in FIG. **6**. It should be stitched to the bigger wing as in 2, 3, 7 in FIG. **8**.

The Beak

Take two triangular bits of cloth for each of the upper and lower lips of the beak (see FIG. **7**). They may be of red, yellow, brown, or black colour. Put the two pieces together and stitch along the edges after stuffing. Stitch along the ridge 1-4 and 5-8. Fold them as in 1, 2, 3, 4, and 5, 6, 7, 8. Insert them into the head in position as in 1-5, and stitch along 10-11, FIG. **8**.

The Tail

The tail, FIG. 9, shows the wire support bent as in 1, 2, 3. It is also made in the same manner as the wing. It is inserted into the body and stitched as in 1, 2, FIG **10**. The wings may be made to look realistic by making close **stem** stitches as shown by the shading in FIGS **8, 10, 11**. In Fig. **11**, the peacock's tail is shown. It is supported by a fan-like framework of wire. The eyes in the tail are made by **long** and **short** stitches made of thread of suitable colour. The tail is bent upward, as in 1, 2, FIG. **11**, inserted into the body and stitched.


2"
6"

BALL, FISH, AND RAT

BALL

To make a ball of 12″ circumference, take a piece of paper 6″ × 2″ and cut it to shape as in FIG. **1**. Place it on either cloth or felt and trace the shape in pencil. Cut along the dotted line allowing some margin all round for folding and stitching. Cut six pieces of the cloth or felt like this. The pieces may be of different colours, as indicated in black and white in FIG. **3**. Take two of these pieces and stitch them along the edges as in FIG. **2**. After stitching together five pieces, take the sixth piece and stitch it to three-fourths of the length. Then stuff it with cotton. The ball may be fairly hard. Close the opening and complete the ball as in FIG. **3**.

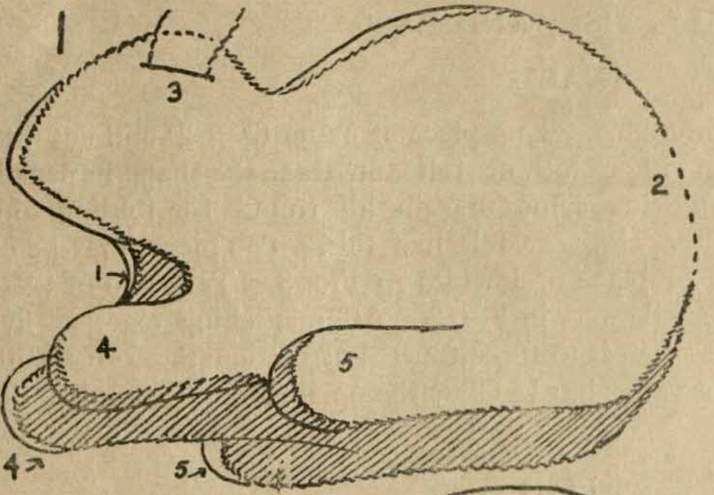
FISH

Draw the figure of the body of a fish on a piece of paper, trace it on cloth and cut two pieces of it with extra margin all round as shown by the dotted line in FIG. **5**. Stitch the two pieces along the border. The stitches should be close and fine. At any convenient spot, leave an opening through which the toy can be stuffed. The narrow corners may be filled with the help of a wooden penholder. Cut and stitch four fins, each with two pieces stitched together as in FIG. **4**. The dotted lines indicate stitches to show the bones of the fins. In each fin, insert thin pieces of card for stiffness. Fix the fins one at the top, one at the bottom, and two at the sides as in 4, 4, 4, FIG. **5**. The fins may be inserted into the body and then stitched. Fix two blue or brown beads for the eyes as in 1, FIG. **5**.

RAT

The making of a toy to represent a rat requires a little more care, as you have to add legs and also an extra piece of cloth under the body. Cut two pieces of ash-coloured cloth for the body. The underside of the body has to be broadened with a gusset, FIG. **7**. Stitch the two body pieces, FIG. **6**, from the nose to the tail leaving an opening between 10 and 11, FIG. **6**. Then stitch the gusset to the lower edges of the body pieces as in 7, FIG. **10**, for broadening the underside of the body. Stuff the toy with any suitable material through the opening, 10-11, and close it. Take four pieces of cloth of shape as in 1, FIG. **8**, and stitch them in the shape of legs and stuff them as in 2 and 3, FIG. **8**. The forelegs are smaller as in 6-6, FIG. **10**. Stitch the legs to the body as in 5-5 and 6-6, FIGS. **6** and **10**. Stitch two pieces of folded cloth for the ears as in 1, FIG. **6**, and fix two beads for the eyes as in 2 FIG. **6**. Stitch a bit of cloth of darker colour for the nose as in 4, and a line, 3, for the mouth. Take two long tapering pieces for the tail as in FIG. **9**, and stitch the edges, stuff the tail and attach it to the body as in 9, FIG. **6**.

1



4

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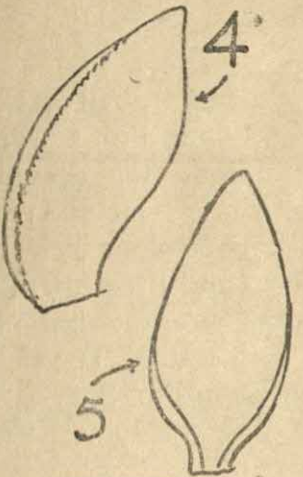

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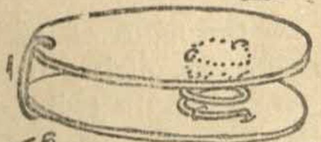

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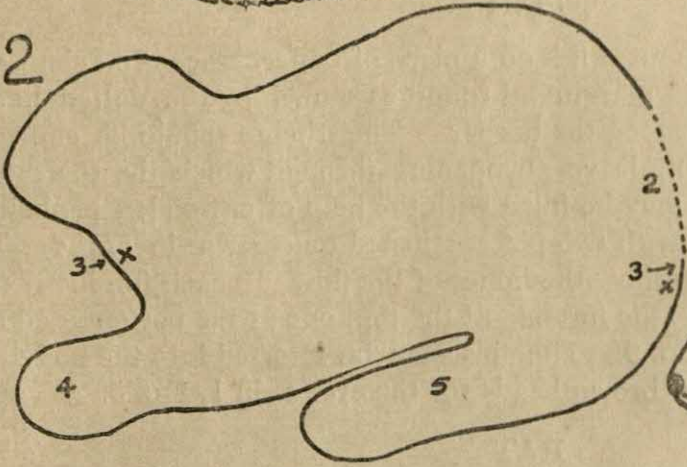

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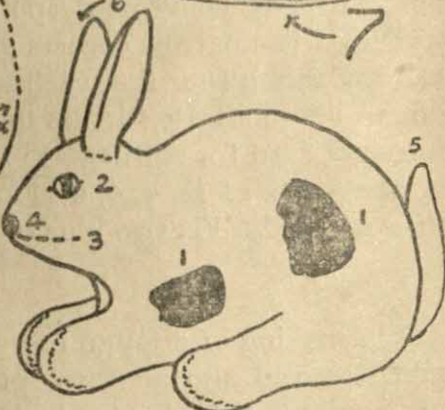

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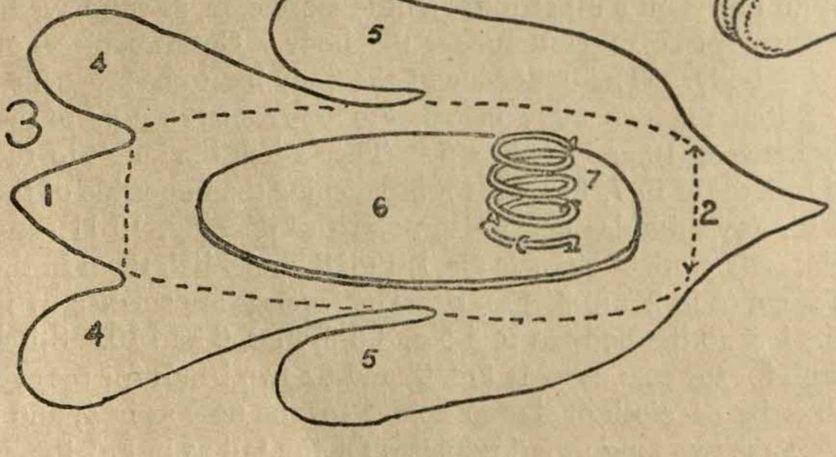
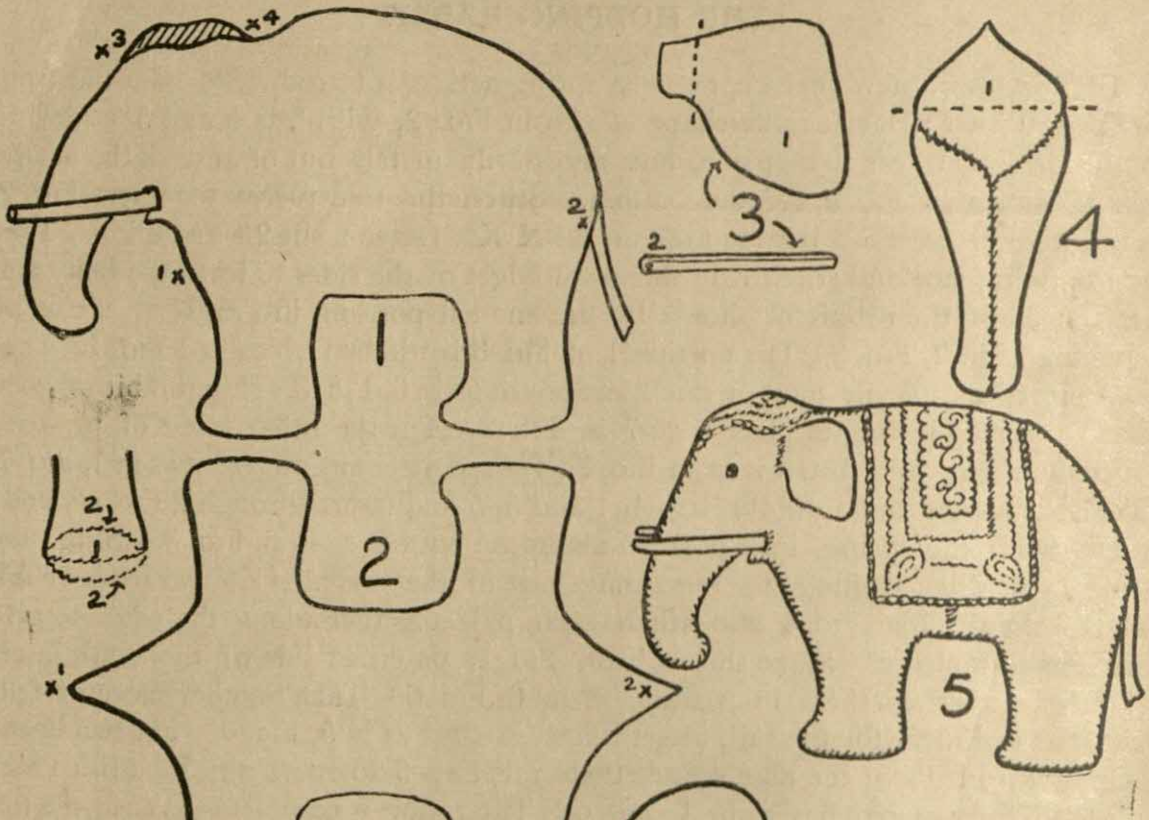


THE HOPPING RABBIT

In this toy, a new feature, namely, spring action, is introduced. Cut out from white felt two pieces of the shape shown in FIG. **2**, with legs 4 and 5 added to the sides. Cut another piece, not necessarily of felt but of any cloth, of the shape shown in FIG. **3**, for the bottom. Stitch the side pieces together, FIG. **2**, along the top edge 3-3 between the marks X-X. Leave a slit 2 for stuffing. Take the bottom piece and stitch it to the lower edges of the sides to form the belly and legs, 4, 5, of the rabbit as shown by the shaded portions in FIG. **1**, but leave an opening as in 2, FIG. **3**. The portion 1 of FIG. **3** is stitched up as in 1 FIG. **1**. Take two pieces of thin plywood or thick cardboard as in 6, FIG. **3**. Fasten a bit of good spring about 1½″ long to piece 6 at 7 in FIG. **3**. Put the other piece of plywood over the spring and fasten it as in FIG. **7**. Tie the pieces in the front as in 1, FIG. **7**. Take the rabbit and stuff the legs 4, 4 and 5, 5 and insert through 2 the plywood pieces with the spring, into position along the bottom as in 6, FIG. **3**. Stitch the opening 2 after stuffing the remaining part of the body. Cut two pairs of felt pieces shaped like FIG. **4** and stitch each pair together along the edges to give stiffness to the ears. Make slits as in 3, FIG. **1**, on either side of the head, insert the ears and stitch them in position as in 6, FIG. **6**. Take another piece of felt, cut it as in FIG. **5**, for the tail, insert it and stitch it as in 5, Fig. **6**. Fix two beads for the eyes. Paint the nose 4 and stitch the line 3 to mark the mouth. Paint black or brown patches as in 1, FIG. **6**. The rabbit is complete. When the toy is gently thrown down on its belly or pressed against the ground, it bumps up due to the action of the spring inside.


x3
x4
1x
2x
2↓
2↗
x1
2x
7↗

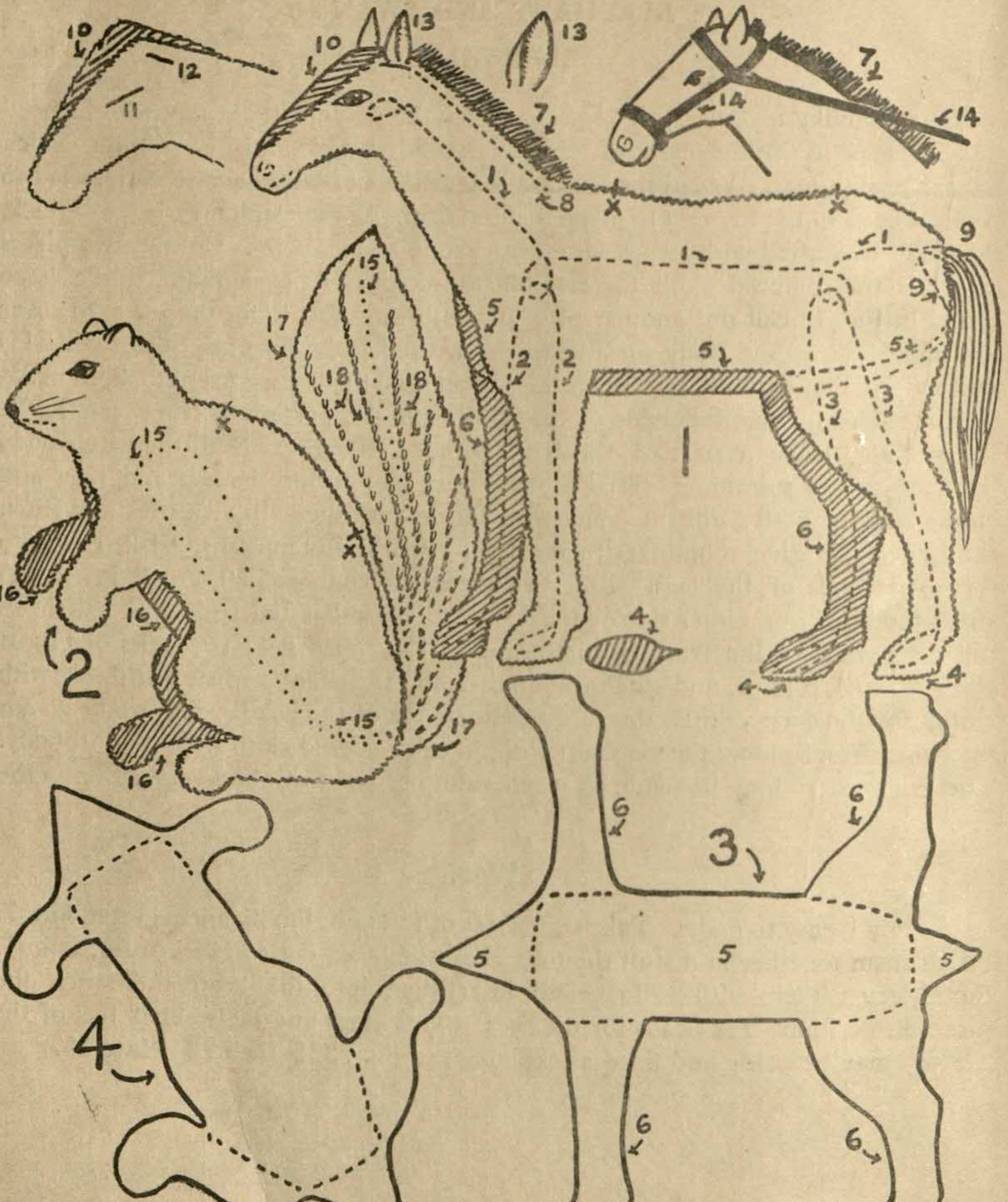
ELEPHANT AND SWAN

ELEPHANT

This is a bulky toy with thick legs. It may be made without any wire inserted into its legs as in the case of the horse, the camel and the girafle, which have long slim legs. When the legs are long, pieces of wire have to be inserted to give strength to the toy and to make it stand firm. As the elephant's legs are thick, they may be stuffed with straw without the support of a wire. Cut out two pieces of any dark coloured cloth to resemble the colour of the elephant, to the shape shown in FIG. **1**. Cut out another piece of cloth as in FIG. **2**, for the gusset to cover the underside of the body and the inside of the legs. The gusset for the head is shown as 1, FIG. **4**. Stitch the two side pieces with the body gusset FIG. **2**, as in 3-4 in FIG. **1**, and for the underside of the body as in the portion 1-2 between X, X. For stuffing, leave a part of the back without stitching. Stuff the whole body tightly with any suitable material. Straw may be put into the legs and rags and cotton into the body. Fill the trunk with cotton with the help of a stick and stitch the back. To give roundness to the legs, stitch round guessets, 2-1-2, FIG. **2**, to the lower ends of the legs. Roll two pieces of cloth as in 2, FIG. **3**, insert and stitch them over on either side of the trunk to represent the tusks. FIG. **4** shows the front view of the trunk with the gusset 1 at top. Take two pairs of bits of cloth as in 1, FIG. **3**, and stitch each pair along the edges and stuff it thinly with cotton for the ears. Stitch the ears on either side of the head. Fix two beads for the eyes. FIG. **5** shows the elephant with an embroidered cloth spread on its body. The embroidery may be made on a separate piece of cloth and stitched on to the toy.

SWAN

This toy is easy to make. Take two pieces of felt as in FIG. **6**, and a gusset, FIG. **7**. Stitch them together and stuff the toy. For the beak, cut two bits of tin, as in 1, FIG. **8**, cover them with yellow cloth, insert them into the head and stitch the pieces in position. Fix beads for the eyes. The wings and the webbed feet of the the toy may be made and fixed as explained in FIGS. **3, 5, 6** and **8, Plate 107**.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HORSE AND SQUIRREL

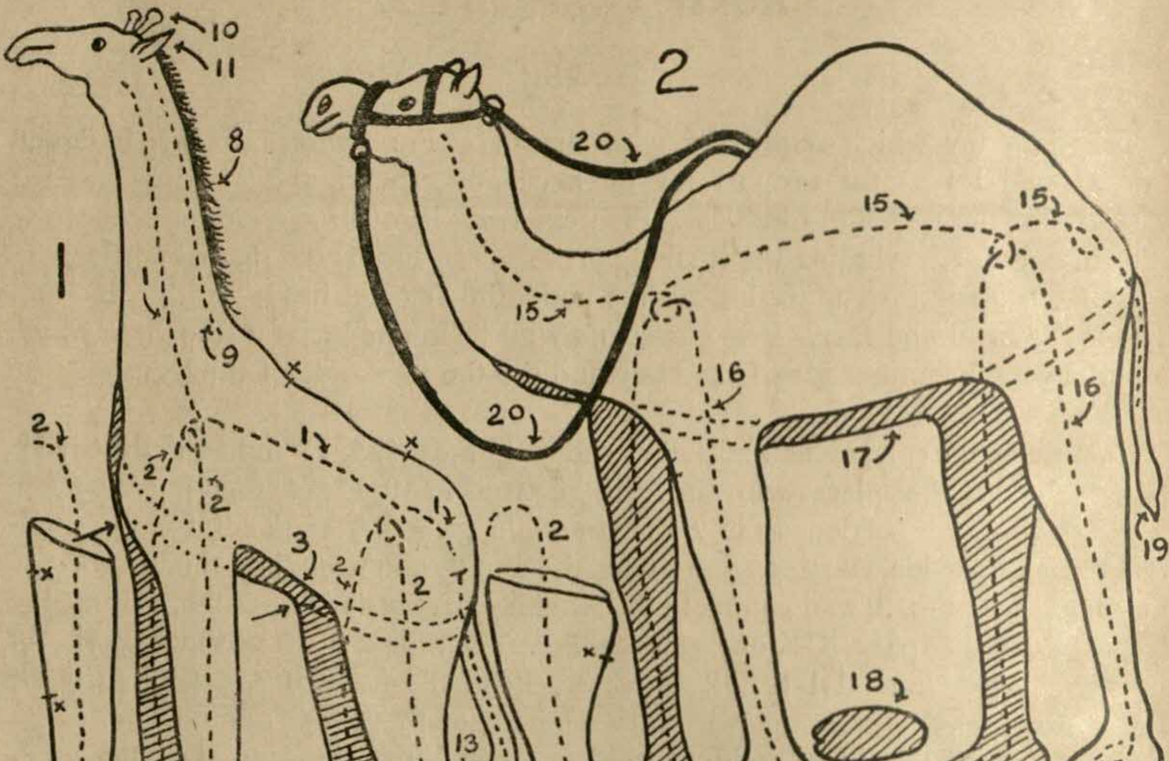
HORSE

This is a toy which requires a wire support. FIG. **1** shows the wire in dotted line as in 1-1-1 as the support for the neck and trunk and 2-2 and 3-3 as the support for the fore and hind legs. First cut two bits of brown cloth of the shape shown in FIG. **1**, excluding the shaded portions. In FIG. **1**, the shaded portions are the gussets 5 for the underside of the body, 6-6 for the inside of the legs and 10 for the head and face. The gussets may all be in one bit as in FIG. **3**, in which 5-5-5 covers the underside of the body and 6-6-6-6 the inside of the legs.

First make the ears, mane and tail as shown in FIGS. **4**, **5**, **13** and **14** in **Plate 106**. Start stitching the pieces with the head gusset as in 10, **Fig. 1**, then put the mane between the neck portions as in 7 and stitch along the dotted line 8. Continue stitching the underside, starting from under the mouth and neck, join the under-body and leg gusset FIG. **3**, and complete the stitching of the lower portion. Stitch the back leaving the space X-X open for stuffing. Then make a wire support as shown by the dotted lines 1-1-1, 2-2 and 3-3. Bend the ends of the wire to make them into circles. Insert the wire into the body of the horse from above through the back. Stuff the animal with cotton and rags—first the legs, then the neck, and lastly the trunk. Push the cotton with a piece of stick well down to the hoofs and also into the neck and head. Stitch gusset 4 under the heels to give a broader base for the legs. Insert the tail into the back as in 9 and stitch it to the side pieces. Close the space X-X. Insert the ears 13 into the head through a slit and stitch. Fix the eyes. Stitch mouth line and nose-piece. Fix the trappings to the head as in 14-14, FIG. **1**.

SQUIRREL

This toy, FIG. **2**, may have a wire to support the tail. The support, 15-15-15, FIG. **2** is inserted into the body for strength. Cut two pieces of felt of the shape shown in FIG. **2**, without the shaded portions. Stitch the pieces together along the head and back up to the tail leaving the space X-X open. There may or may not be a gusset for the head. Cut the under-body gusset as in FIG. **4**, and stitch it to the edges of the side pieces as shown in the shaded portions in 16, FIG. **2**. Cut two pieces for the tail as in 17-17, and stitch the edges after stuffing. Push the wire support 15 into the tail from the bottom end. Fix the eyes, ears and whiskers as shown in **Plate 106**, FIGS. **1** to **6**. It should be noted that the ears of a squirrel are small.



THE GIRAFFE, CAMEL AND PARROT

GIRAFFE

The giraffe and the camel require wire supports as their necks and legs are very long. In these toys, it has been shown that the leg gussets may be separately cut out and stitched to the inside of the legs coming from the side-pieces.

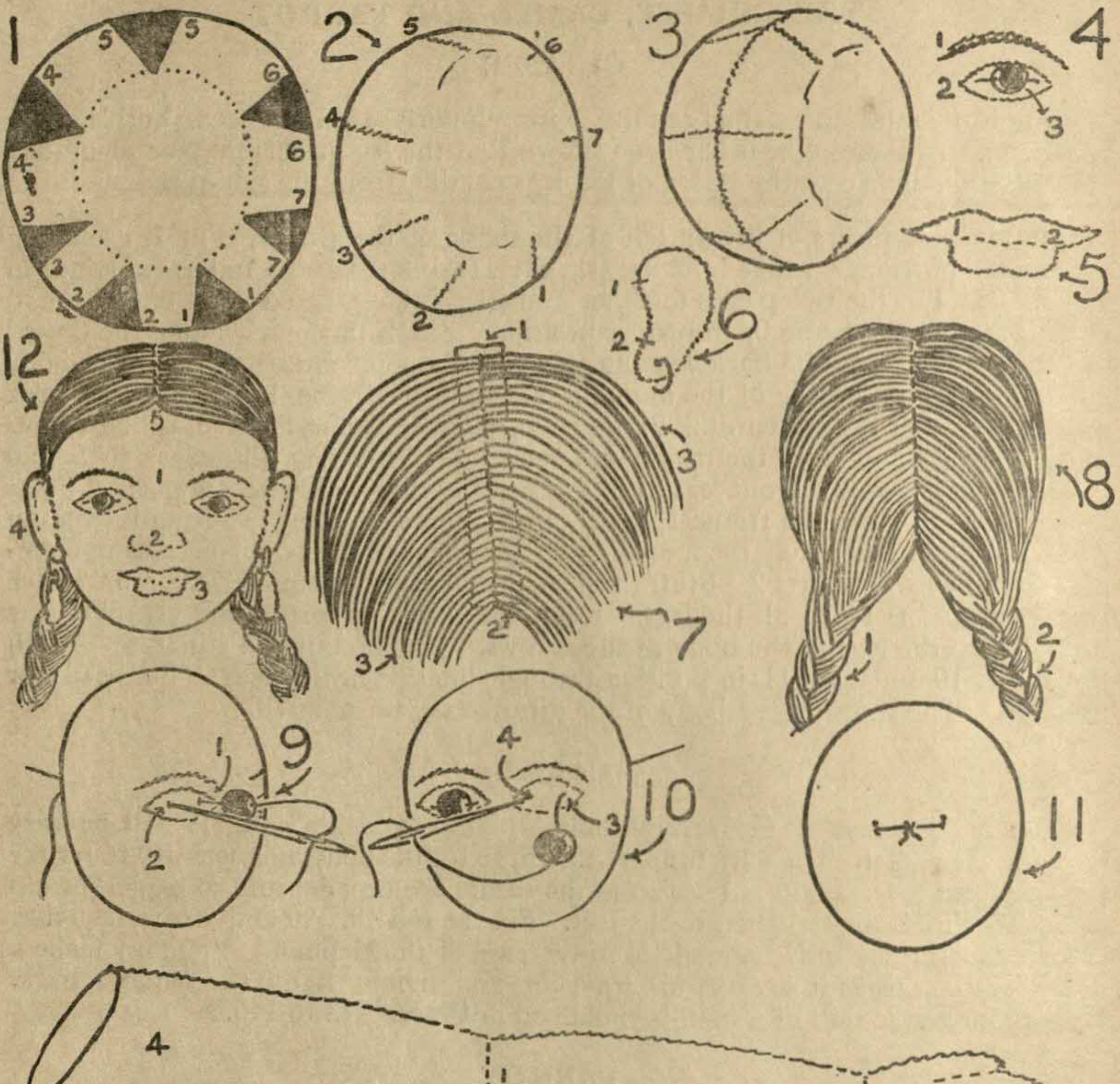
Cut two side-pieces of brown felt of the shape of the giraffe, Fig. **1**, excluding the shaded portions. Make a mane, two ears, two horns and a tail as explained in **Plate 106**. Put the two pieces together and stitch along the edges of the head and neck inserting the mane 8, in proper position. Stitch the mane along the dotted line 9. Stitch along the back leaving space X-X open, and stitch the under-body gusset 3 to the underside of the animal. Fix the wire frame 1, 1, 1 into the neck and trunk. Let the leg wires 2, 2, pierce through the holes marked as black spots in the gusset 3 and stuff the trunk and neck. Cut two leg gussets as in 5 and stitch them as the two front legs as in 4, encasing the two wire supports 2, that have come out from the frame 1, 1, 1. In the same way cut two leg gussets as in 7 for hind legs and stitch them as the two hind legs of the body piece as in 6, encasing the wire supports 2. Stuff the legs through the opening X-X in 5. Stitch the hoof gussets 14 to all the legs. Keep the wire support to the centre of the leg. Stitch the legs to the body at the arrows. Fix the tail and stitch it. Stitch the horns 10 and ears 11 in position through the slits in the head. Fix beads for the eyes. The spots on the body of the giraffe may be painted.

CAMEL

After making toys of the several animals already dealt with, it will be easy to make the camel. The wire support 15, 15, 15 for the body and neck 16, 16 for the legs are fixed to the body. The feet of the camel are broader and so bigger gussets as in 18 Fig. **2** are stitched to the feet. Fix the tail 19. 20 and 20 are the reins. Other decorations may be made as in the case of the elephant. You may make a doll of a man, dress it as an Arab traveller and mount it on the camel's back. How to make the doll of a man is explained in **Plates 113 to 115**.

PARROT

The parrot is a simpler toy. Cut two pieces of green felt for the body from head to tail. Stitch them together with a body gusset 21. Make two legs 24, 24 as explained in Fig. **4, Plate 107.** 25 is the wire support for the legs. Cut two pieces in red colour as in 22 and stitch them along the edges. Make the lower beak as in 23. Put them through the slits made in the head and stitch both the parts to the head. Stitch a crest to the head. Make two long wings and two short ones as explained in Figs. **5** and **6** in **Plate 107**, stitch the big wings 27, Fig. **3,** on the two sides of the bird. Put the smaller ones 26 on them and stitch them. Embroider the wings and tail with **long** and **short** stitches.



DOLLS

It is a little more difficult to make dolls than to make toys of animals and birds, because in the case of dolls we have to show features and dresses distinctly for men or women or boys or girls, as also ornaments according to the sexes. So it requires some thinking and skill, especially in making the head. The dolls may have movable hands and legs. They may be supported by wire.

The head is made either by stuffing a casing, Fig. **3**, or by making a mould with paper pulp as in Figs. **1** to **3** in **Plate 115**. The head can be made similarly for a boy or a girl, a man or a woman by simply changing the features and the dress. If you add a cap or cropped hair, it would represent a boy. If you plait the hair and adorn it with a ribbon and flowers, it would show a girl. Likewise a boy will have knickers and a shirt. A girl will have a skirt or frock and a jacket. A lady will have a saree and a man will have a dhoti or pants and so on. If it is a doll of a baby, the head should be about a fourth of the height of the body. For a grown-up child, the head should be about a fifth of the height. For a grown-up man or woman, the head must be about a sixth or seventh of the height. You will do well to study various poses and fashions in pictures that you come across. In making a doll, first determine the size of the doll and its parts by drawing the whole figure on paper. Make the different parts according to their proportion with reference to the drawing.

The Head

Take two bits of cloth, oval in shape, according to the size of the doll required. Cut off the shaded parts in Fig. **1**. Stitch together edges 1-1, 2-2, 3-3, 4-4, 5-5, 6-6, and 7-7. You will get two semi-ellipsoids, Fig. **1**. Stitch them together into a full ellipsoid, Fig. **3**. Before you close the opening, stuff it tightly with cotton.

Eyes

Divide the face into four parts and fix the eyes along the middle line. First stitch two bits of white cloth as in 2, Fig. **4**, on the middle line. Stitch the lines for eyebrows, as in 1, Fig. **4**. Then take a piece of strong twine on a needle, pass it through the head from behind and take it out in front at 1, Fig. **9**. Take a glass bead on the twine and pass the needle through 2 to the back. Again pass the needle to the front through 3, Fig. **11**, take another bead and pass the twine to the back through 4. Pull the twine well and tie the ends tightly at the back as in Fig. **12**. If you pull the twine hard, the beads will be well pressed into the white cloth and they will look like eyeballs in sockets as in 3, Fig. **4**. You can make the doll look sideways by moving both the beads to the right or left.

The Nose

Cut a piece of cloth of the same colour as for the head as in Fig. **13**. Stitch the parts 1-1 together and 2-2 together. A cup is formed. Stuff it and put it on the face between 1 and 2 between the eyes as in Fig. **12**, and stitch it along 3-4, Fig. **13**.

The Lips

Cut a piece of red cloth to shape as in Fig. **5**, with both the upper and lower parts in one piece. Stitch the whole piece to the face as in 3, Fig. **12**. Stitch a line as in 1-2, Fig. **5**, so that the upper and lower parts are well shown.

The Ears

Cut four bits of cloth as in Fig. **6**. Stitch two pieces together along the edge for each ear and stitch it along 1-2, Fig. **6**, to the side of the head as in 4, Fig. **12**.

The Hair

Take a bit of black tape 1-2, Fig. **7**, long enough to cover the head from the forehead to the back. Lay long bits of black wool across it, 3-3, Fig. **7**, and stitch them to the tape from 1 to 2, Fig. **7**. Stitch the whole wig to the top of the head as in 5, Fig. **12**. Plait the two sides as in 1 and 2, Fig. **8**.

The Hands

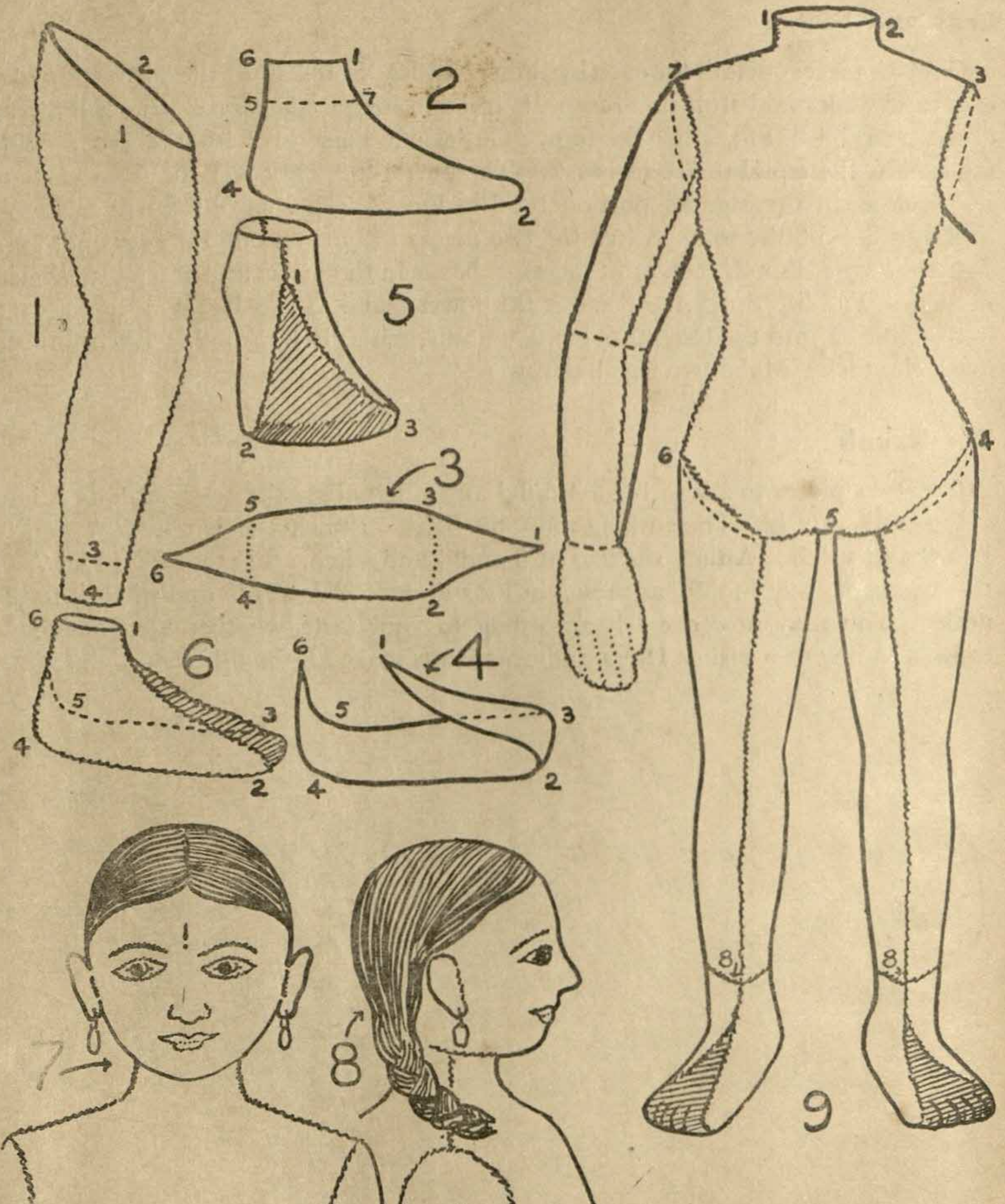
Cut four pieces of cloth as in Fig. **14** marking the upper arm, 4, lower arm 1 and hand 2, 3. Stitch two pieces along the edges upto the upper end leaving an opening 2-2, Fig. **15**, in the hand. Stitch along 1, 1, 1, 1 to mark off the fingers, Fig. **15**. Stuff the hand and fingers through 2-2, Fig. **15** and close it up. Make a stitch across at 3 and stuff upto 1, Fig. **14**, and stich across to mark off the lower arm. Then stuff the upper arm between 1 and 4. Complete the two hands. These have to be attached to the body along 4, Fig. **14**. The purpose in stitching along lines 1 and 2 in Fig. **14** is to make the hand bend at the elbow and wrist.

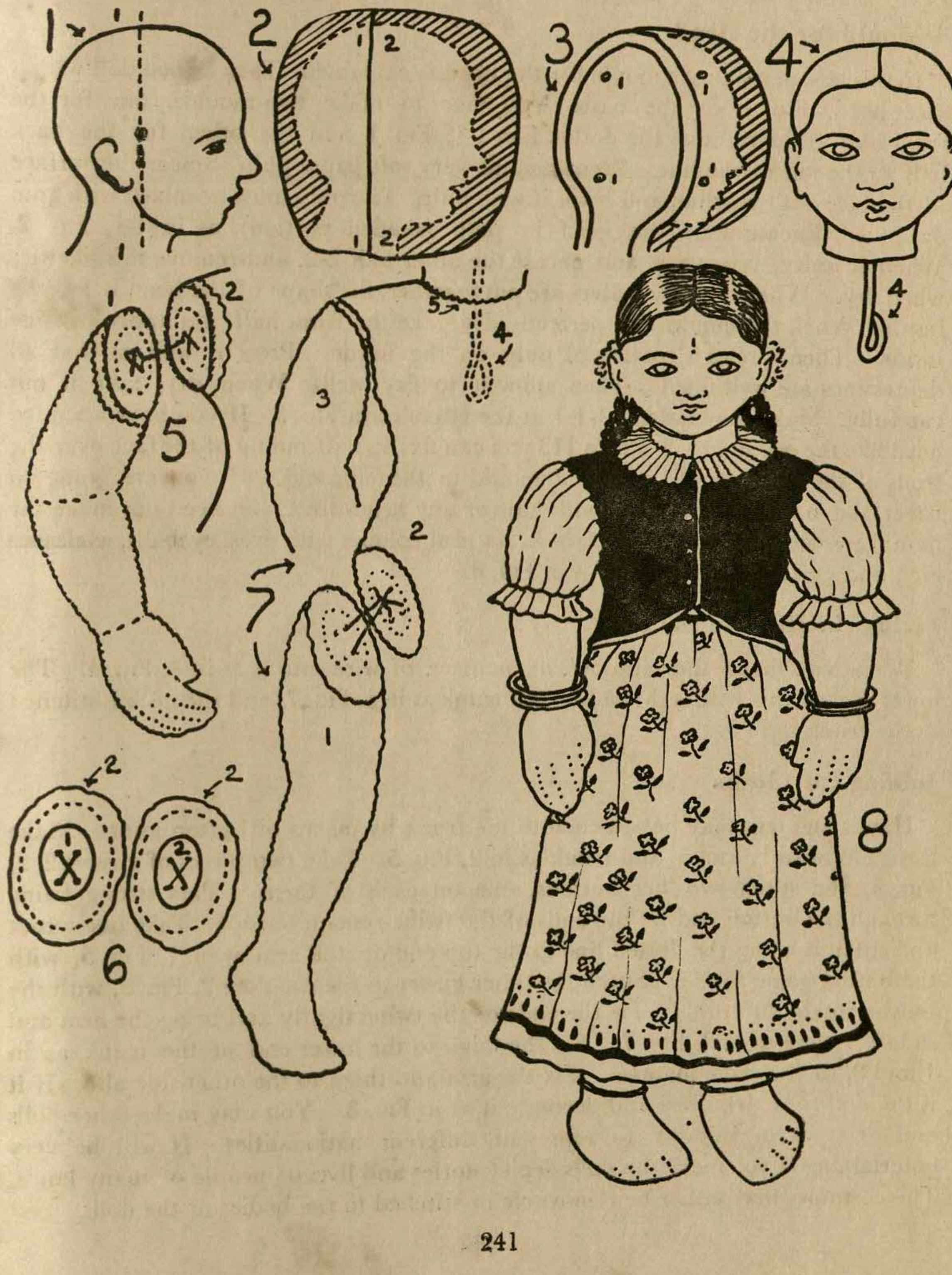
Legs and Feet

Cut two pieces of cloth for each leg, Figs. **1** and **2**. Stitch along the edges and make each a cylinder and stuff it. Keep the top and lower ends open. Cut two pieces of shape 1-2-4-6, Fig. **2** for the foot. Cut also a gusset 1-2-4-6-5-3, Fig. **3**, with the length 2-4 equal to 2-4 in Fig. **2**. The part 1-2-3 will cover the front part of the foot as in the shaded portion 1-2-3 in Fig. **5**. The part 4-6-5 will cover the heel and 2-4-5-3 the sole. Stitch the two pieces in Fig. **1** along the edges upto the dotted line 5-7, Fig. **2**, then put the gusset between the pieces and stitch it as shown shaded in Fig. **5**. Stuff it and insert the lower end 4 of the leg, Fig. **1**, upto the dotted line 3 into the foot at 6-1 Fig. **6** and stitch as in 8, Fig. **9**. Stitch lines to mark the toes. Make two legs like this.

The Trunk

Cut two pieces to shape 1-2-3-4-5-6-7 and stitch along the edges making it into a bag and stuff it. The stuffing must be tight. Attach the hands at 7 and 3, Fig. **9** and stitch. Attach the legs at 6 and 4 and stitch. Fix the head, Fig. **7**, to the trunk at 1-2, Fig. **9**, as shown in Figs. **4** and **7**, **Plate 115** and stitch it to the neck. You may now dress it according to your taste, whether as a man or a woman, a boy or a girl. Dress and ornaments make all the difference.

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A Mould for the Head

In this lesson, making a mould for the head is explained. Take a good doll with a nice head, FIG. 1, as the basis. You have to make two moulds, one for the front half to the right of the dotted line 1-1, FIG. 1 and the other for the back half to the left of the line. Prepare some very soft paper pulp. Smear the surface of the face with vaseline and cover it with pulp. The pulp must be mixed with gum or glue. Encase half the head in pulp (shaded portion) as in 1-1, FIG. 2. When it is dry, remove it and encase the other half 2-2, and remove this likewise when dry. When both the halves are put together, the shape of the head is formed inside. When the moulds are perfectly dry, take the front half and apply vaseline inside. Then spread a coating of pulp on the inside. Press it well so that all depressions are well filled. Then allow it to dry well. When dry, take it out carefully. Make four holes 1-1-1-1 at the edges as in FIG. 3. If you have a stuffed head like the one in FIG. 3, **Plate 113** you can fix this half mould of the face over the front of the ellipsoid and stitch the mould to the ellipsoid. If you are going to cover the back of the head with hair or any head-dress, you need not make the mould for the back. Paint the face in natural colours with eyes, eyeballs, eyelashes etc., and make it look realistic as in FIG. 8.

Fixing the Head to the Body

When you make the ellipsoid, fix a piece of wire into it as in 4, FIG. 4. The lower end of this wire is thrust into the trunk as in 4, FIG. 7, and the neck is stitched to the trunk as in 5.

Joining the Limbs

Hands and legs may be attached to the trunk by means of button joints. Make the hand as in 1, FIG. 5, and trunk as in 2, FIG. 5. Take two pieces of gussets 2, 2, FIG. 6, and stitch two big buttons, one on each of them. Pass strong twine through the button and let the ends of the twine remain outside. Take one gusset and stitch it along the dotted line to the top end of the arm as in 1, FIG. 5, with the button going inside. Stitch the other gusset to the shoulder 2, FIG. 5, with the button inside the trunk. Tie the ends of the twine tightly and bring the arm and shoulder close as in 3, FIG. 7. Fix the thigh to the lower end of the trunk as in 1 and 2, in the same manner. Fix the arm and thigh to the other side also. If it is the doll of a girl, dress and decorate it as in FIG. 8. You may make other dolls and dress them suitably to represent different nationalities. It will be very entertaining if you make the dolls depict stories and lives of people of many lands. The costumes may either be removable or stitched to the bodies of the dolls.

ORIENT LONGMANS